AIR CONDITIONING HEATING AND VENTILATING

JUNE 1960

For the Engineer
Engaged in DESIGN
APPLICATION
ESTIMATING
SPECIFICATION
and LAYOUT

Hospital Air Conditioning Design Data 75

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Each department of a hospital requires a special air conditioning system. For concise design data and practices regarding the air conditioning of hospitals, see page 75.

MARSH PACKLESS RADIATOR VALVES

WHEEL HANDLE

GRADUATED

LOCK AND SHIELD

ANGLE PATTERN

GLOBE PATTERN

CORNER PATTERN (Sectional Below)

MARSH THERMOSTATIC RADIATOR TRAPS

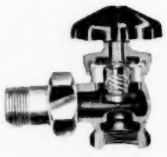
ANGLE PATTERN

STRAIGHTWAY PATTERN

VERTICAL PATTERN

LEFT HAND CORNER PATTERN

RIGHT HAND CORNER PATTERN



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F&T TRAPS

No. 12, REPRESENTATIVE OF WIDE LINE

VENTS

No. 5 VENT, ONE OF MANY

BUCKET TRAPS

No. 500 INVERTED BUCKET TRAP

All the best of their kind!

You probably have made certain Marsh products your standbys without realizing there are a lot more of them just as superlative as the ones you like so well.

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Division of Colorado Oil and Gas Corporation
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Heating Specialties since 1865

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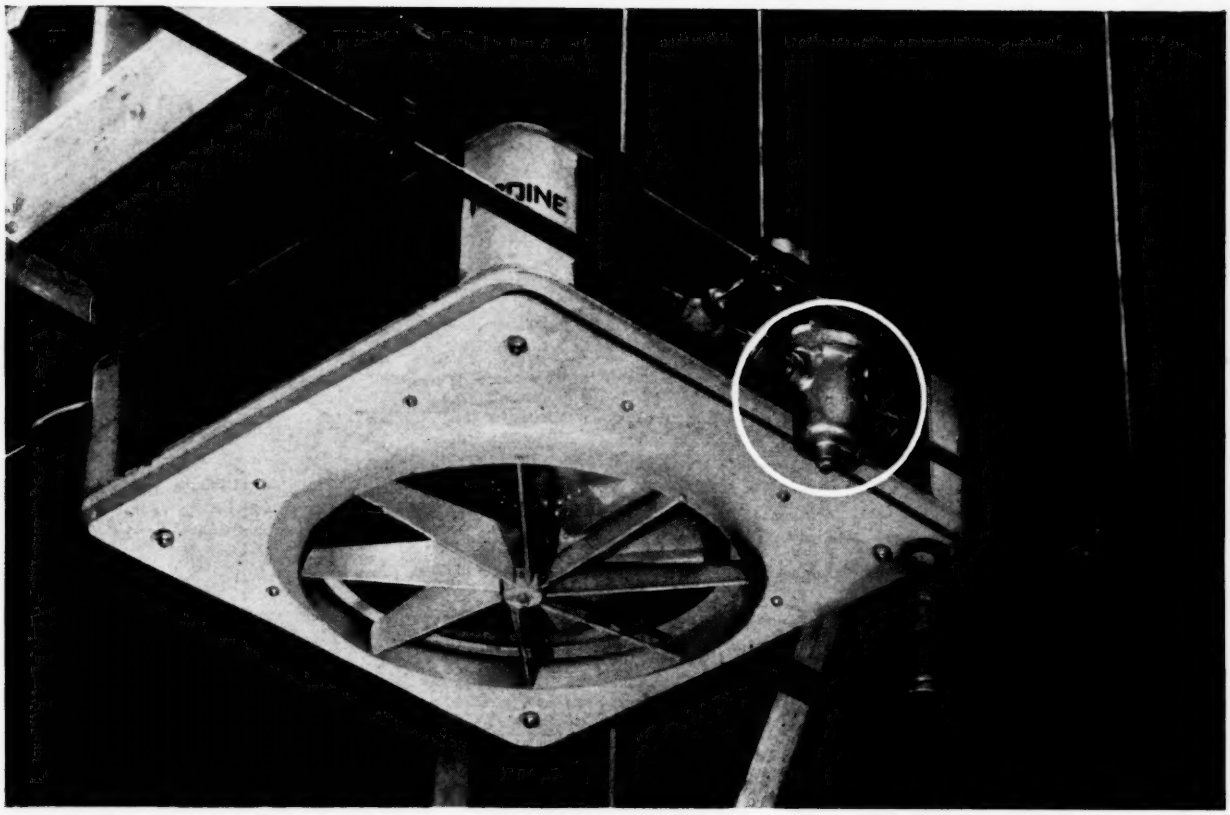
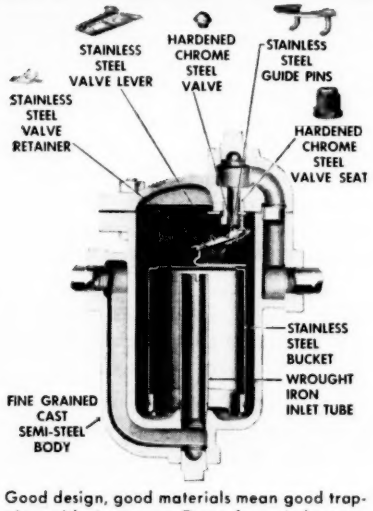
HOT WATER BOILER THERMOMETER

PIPING THERMOMETER
Four Ranges
(Also remote reading)

DUCT THERMOMETER
Three Ranges
(Also remote reading)



How Corrosion of Unit Heaters is Prevented by Good Trapping


STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY

Good design, good materials mean good trapping with Armstrong Traps for unit heaters.

Cause. Costly corrosion of unit heaters is frequently the result of sluggish condensate drainage and inadequate venting. Any carbon dioxide gas present in the steam supply will go into solution if the condensate is below steam temperature, forming corrosive carbonic acid. Presence of oxygen aggravates the corrosion.

Remedy. Armstrong traps prevent carbonic acid formation because they discharge condensate *at steam temperature* and vent CO_2 and air at the same time. There is never any accumulation of condensate and incondensible gases to cause trouble as can occur with traps that must wait for condensate to cool before they will open.

Trap Selection. It is important that the traps be correctly sized, with a generous safety factor to provide adequate air handling capacity. Armstrong sizing recommedations are thoroughly reliable, being based on actual performance of the traps under operating conditions rather than on theoretical considerations.

Complete Details. Ask for Armstrong Bulletin No. 252 which tells how to select and install traps for any type of unit heater. For your free copy, call your local Armstrong Factory Representative, or write direct.

860 Series for low pressure heating service.

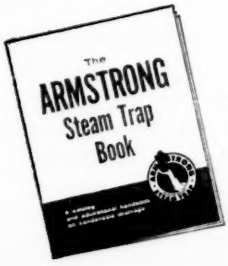
800 Series, side inlet, side outlet.

No. 801, side inlet, bottom outlet.

880 Series, integral strainer.

200 Series, bottom inlet, top outlet.

Forged Steel Series for high pressures, high temperatures.



The 48 page Armstrong Steam Trap Book tells how to correctly size, install and maintain steam traps for any pressure, any temperature, any load plus full catalog data on Armstrong Steam Traps. Ask for Catalog K.

ARMSTRONG MACHINE WORKS

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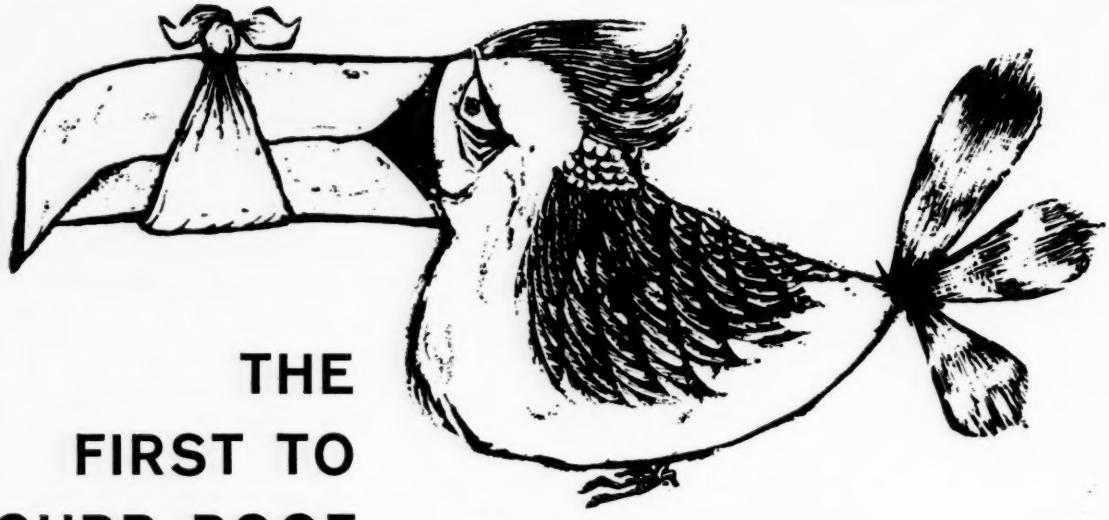
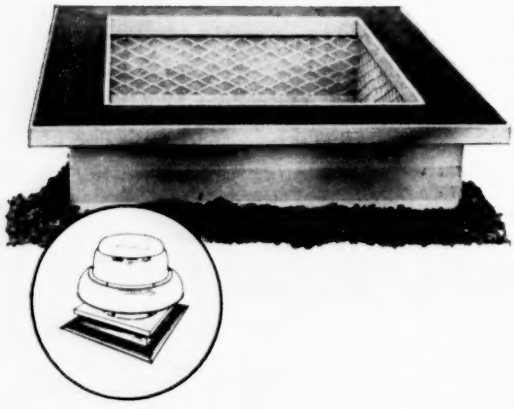
"See Our Catalog in Sweets Industrial Construction File"



THE FIRST TO CURB ROOF EXHAUSTER NOISES WERE ENGINEERS AT PENN!



Penn's SONOTROL CURB *for all roof ventilator installations provides* 3 IMPORTANT BENEFITS *to the Specifying Engineer*

Putting the curb on prevailing problems that accompany roof ventilator installations was no easy task. Roof fan sounds had to be hushed. Field constructed curbs were often haphazardly put together; they overloaded roofs and lacked dimensional coordination for ventilators and dampers. But, engineers working at Penn developed the industry's first solution . . . the *Sonotrol Curb!*

EXTRUDED ALUMINUM, an exclusive in Penn's Sonotrol design features structural "I" beam lifetime construction; reinforced seamless outside wall; loading capability of more than 700 lbs. per lineal ft. with a minimum safety factor of 2.5; provides stabilized dimensions for all dampers and ventilators . . . and everything fits!

ACOUSTICAL-THERMAL INSULATION reduces decible build-up of exhauster at the source; attenuates resonance and reverberation; minimizes sone values; no reduction in air movement.

SELF-FLASHING eliminates the problem of field flashing over the Curb; installation is simplified; flashing flange incorporates V-groove serrations for maximum gripping power.

Get complete facts now on how Penn Ventilator can be your one source for the universally accepted Sonotrol Curb, Damper and Ventilator. Contact your local representative or write direct.

PENN VENTILATOR CO., Inc.
PHILADELPHIA 40, PENNA.

A leading manufacturer of Powered and Gravity Roof Exhausters and Accessory Equipment for over 30 years.

Charter Member of AMCA

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AIR CONDITIONING HEATING AND VENTILATING

Volume 57, Number 6 June, 1960

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COVER PHOTO: While the operating room sometimes serves to symbolize the functions of a modern hospital, there are actually many other activities, each of which is usually a segregated area with its own special design considerations as far as air conditioning is concerned. In this month's **Reference Section,** beginning on page 75, author Irwin S. Herbst guides us through the various areas of a hospital, supplementing a thorough discussion of **hospital air conditioning** with specific design requirements according to area function.

HIGH SPOTS in this issue

COMPARATIVE COSTS: Probably one of the most unusual aspects of high velocity dual duct systems is the impossibility of putting a price tag on the system, due to the exceptionally wide range in installed costs. So states N. S. Shataloff in introducing his highly informative article, **Comparative Cost of High Velocity Dual Duct Systems,** beginning on page 55.

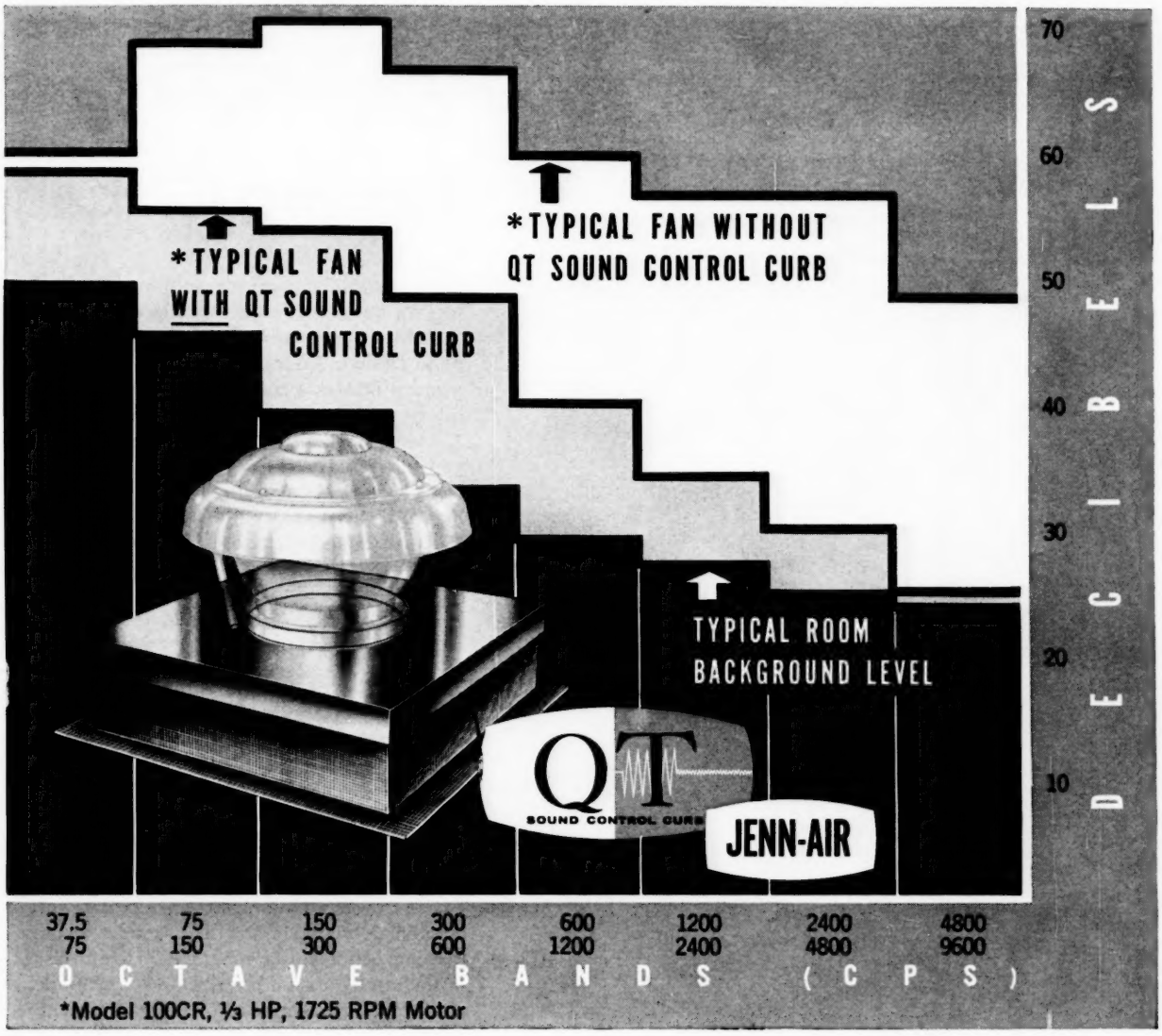
LIQUOR CHILLING: In order to clarify the public image of their product, many distilleries are using **mechanical refrigeration as a preventive measure** to insure against cloudiness of the liquor after bottling. On page 87, C. S. Cave presents data for sizing packaged liquid chillers in this high-spirited application.

A NEW WRINKLE: With photos, diagrams, and text, a reporter from Tulsa, Oklahoma, tells how valleys between sections of a bowling alley roof, made up of thin-shelled concrete barrels, were used to form two sides of the triangular air ducts supplying conditioned air through ceiling grilles. Starts on page 62.

HIGH TEMPERATURE WATER: This month's **Applications and Installations** Department contains a report on the first plant in the Western Hemisphere to generate high temperature water for district heating from steam extracted from turbine generator units. Two steam generators are currently producing high temperature water directly in a "ghost increment" for the U.S. Air Force in Newfoundland. Page 90.

INTERCHANGER APPLICATION: The proper use of **liquid-suction heat interchangers** in Refrigerant-22 systems is the subject of Leonard N. Brown. Containing specific recommendations, this article begins on page 64.

CONSULTANTS DEFENDED: Recommendations in a Congressional report that the federal government consider **reducing the use of private engineering services on public works projects** were contested by Ralph M. Westcott, president of Consulting Engineers Council, in appearance at Senate and House hearings. For details, see lead story in **News of the Month,** page 8.



MOST EFFECTIVE NOISE SUPPRESSOR
in power exhauster history!

Octave band analysis proves attenuating ability of new Jenn-Air QT Sound Control Curb

The above graph presents a direct comparison (in decibels) of noise generated by two identical power exhausters, one mounted on a standard curb, the other on the new Jenn-Air QT Sound Control Curb. Note that virtually all high frequency noises — the noises most distracting to the average person — are eliminated by the QT Curb. It reduces an exhauster's apparent loudness to the human ear by about two-thirds.

Other test findings show that the QT Sound Control Curb:

- Absorbs more than 90% of an exhauster's inlet sound power in less than one foot of space . . . the equivalent of 18 feet of 14" square duct lined with glass fibre 1" thick.
- Achieves a sound reduction equivalent to reducing fan speed 43%. Fan noise of a 1725 rpm fan, for example, is reduced to that of a 983 rpm unit.
- Maintains air moving efficiency at better than 90%. A unit rated at 1640 cfm, for example, delivers 1476 cfm.

The Jenn-Air QT Sound Control Curb is prefabricated, self-flashing, thermo-insulated. It's as easy to install as the conventional curb it replaces. Write for Bulletin 60-SC.

Test results verified by an independent laboratory.

JENN-AIR

JENN-AIR PRODUCTS CO., INC.
1102 Stadium Drive
Indianapolis 7, Indiana

How *Imaginative Engineering* Put Taming Chicago's

John Dolio (right) in front of Powers Graph-O-Matic Control Panel with E. S. Anderson, engineer for the Illinois Psychiatric Institute.

The unusual temperature requirements specified for the new Illinois Psychiatric Institute presented an extraordinary challenge for John Dolio & Associates. This Chicago engineering firm was asked to provide an absolutely uniform temperature throughout the 11-story, T-shaped building. Because temperature variations cause extreme discomfort —even pain—to mental patients, the system had to be accurate, foolproof and automatic. Because Chicago temperatures rise or fall to extremes within hours—sometimes minutes —the system had to be capable of sensing the changing weather picture outside and automatically and simultaneously reacting inside.

The resulting design provides all the answers . . . in a Powers pneumatic control system that operates automatically 24 hours a day—every day—at a bare minimum of cost; a system that compensates instantly for sudden outdoor temperature changes; a system that can be checked and controlled by one man.

The result is a functional system of control where practical engineering principles were combined by the Dolio firm with a strong helping of ingenuity in order to whip some of the more unusual problems. For example, since chilled water was to circulate through ceiling heating-cooling panels, a safeguard against condensation was necessary. The engineers solved this problem with a series of dew point controls mounted at various locations in the ceilings. Thus, "controls on a control" prevent water temperature from falling to the point at which condensation could occur.

Phil Derrig, Chief Mechanical Engineer of the Dolio firm, inspects one of the dew point controls specially designed to prevent condensation of cold water in the ceiling heating-cooling panels.

Powers Temperature Control To Work Weather At Illinois Psychiatric Institute

Illinois Psychiatric Institute
Chicago, Ill.

Illinois Supervising Architect:
Louis H. Gerding

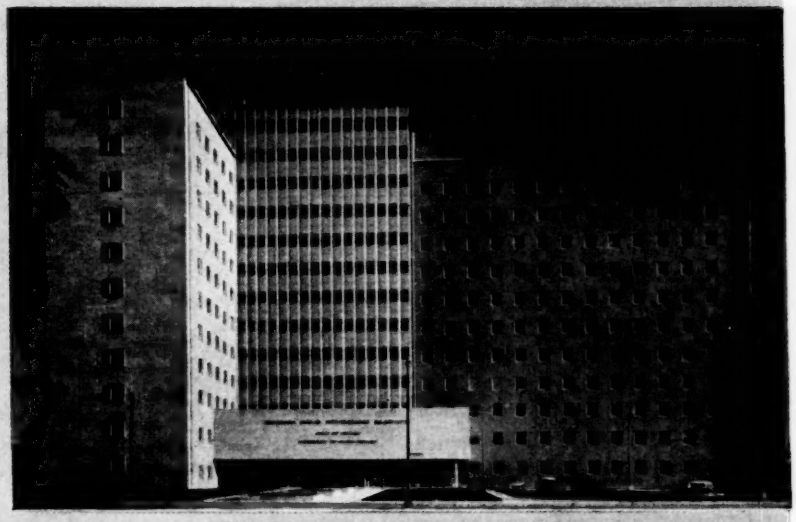
Architects:
Shaw, Metz & Associates, Chicago

Associate Architects and Engineers:
Fugard, Burt, Wilkinson and Orth

Consulting Engineers:
John Dolio & Associates, Chicago

Heating, Air Conditioning Contractor:
Gallaher and Speck, Inc., Chicago

Ventilation: Zack Co., Chicago



JOB DETAILS

The system encompasses 12 temperature zones, each designed to operate independently in relation to individual zone exposure problems. Ten zones utilize ceiling heating and cooling panels at which hot and chilled water circulate from zone exchangers. Three-way control valves for the water are modulated by pneumatic thermostats in various rooms. Two zones — auditorium and stairwell — have only heat exchangers (the auditorium is supplied with individual conditioned air).

Master outdoor controls sense the changes in temperature outdoors and instantly reset submaster pneumatic thermostats at the zone exchangers. These indoor-outdoor controls are engineered for foolproof maintenance of uniform zone temperatures.

A central control board, the heart of the Dolio design, monitors the complete heating, cooling and ventilating system. The building engineer alone can instantly check 170 control points by merely referring to the Powers Graph-O-Matic Control Panel.

Temperature controls are inaccessible to patients. All controls in the corridors are wall-mounted and cabinet-enclosed; temperature sensors are mounted in ceiling exhaust ducts.

Easy servicing and low maintenance are two big reasons why a pneumatic system of control was specified by this engineering firm. Efficiency at low cost is characteristic of this type of control — as it is with the Powers pneumatic system installed here.

Safety and comfort for patients is provided for throughout. For example, in hydrotherapy, in showers, in sitz baths, etc., Powers Hydroguard® thermostatic water controls prevent scalding and eliminate dangerous water temperature fluctuations.

Write for the latest Powers Hospital Catalog.
Write us also for catalog on time-saving, money-saving pneumatic tube systems manufactured by our new subsidiary, the Grover Company.

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DEPT. 660 — SKOKIE 82, ILLINOIS | *Offices in Principal Cities in U.S.A. and Canada*
MANUFACTURERS OF THERMOSTATIC CONTROLS SINCE 1891

NEWS OF THE MONTH

STRESS STANDARD DESIGNS BOILER EXECUTIVE URGES

With the current emphasis on production cost savings in the face of price-conscious customers, foreign-made competition, and the development of new substitute materials looking for new markets and applications, Walter B. Riley, vice president and sales manager of Boiler Engineering & Supply Co., Inc., Phoenixville, Pa., urged some thought should be given by buyers and sellers alike to the need for real or fancied special designs and constructions in generally accepted standard capital equipment.

Frequently minor design and construction changes in otherwise standard items of capital equipment run up the purchase price to exorbitant levels. The required estimates and instructions that must be prepared by the supplier's sales department, the engineering drawing changes that must be made for the guidance of the production department, the special individual purchases at higher cost than normal quantity buying, the possible need for special tools, and the departure from normal manufacturing routines in the shop all conspire to raise the cost of an otherwise minor change out of all proportion to its benefit to the ultimate buyer or user, it was stated.

Manufacturers of all types of supplies and equipment are urging their salesmen to reason more intelligently with their customers, according to Mr. Riley.

PLATES PUSH PUMPS. They laughed when Reginald Stark, a pump salesman for Aetna Engineering Co., a New England distributor for Deming pumps and water systems, arrived for a recent pump school at the Deming plant in Salem, Ohio. Stark's car sported new 1960 Vermont plates which advertise the fact that the car's owner is a pump salesman. He pays an extra $5.00 a year for the special four-letter plates but feels that the "public relations" are worth it.

Fights Move to Bolster Government Staffs At the Expense of Private Engineering

Strong arguments in favor of using consulting engineers on public works projects were heard by the Public Works subcommittees of the House and Senate with the appearance before them of Ralph M. Westcott, president of Consulting Engineers Council, accompanied by L. K. Crawford, CEC's Highway Committee chairman.

Calling specific attention to last year's Report 424, which accompanied the Public Works Appropriations Bill for fiscal 1960, Mr. Westcott expressed concern over recommendations that the government consider reducing the use of private engineering services. Referring to U.S. consulting engineers as "a great reservoir of engineering strength upon which the nation has twice called within the last two decades," he pointed out that any efforts to cut down this potential may lead to serious consequences in case of national emergencies.

Issue was also taken with recent statements which have urged a massive build-up of public engineering staffs. Arguing that, in most cases, such increases are unnecessary, except to handle specific problems or temporary work loads, the CEC president suggested that far more flexibility could be obtained through use of consultants to handle peak loads.

Cost Data Presented

Principal attention was given in the testimony to the relationship between costs on public and private engineering projects. Specifically citing his own state (California), which is often held up as having an ideal highway department, Mr. Westcott quoted a state highway report showing expenditures of 13.68% for preliminary engineering costs, and 10.27% for construction engineering costs. This was compared by the CEC executive to an average 4% of cost of construction on highway work performed by Pennsylvania consulting engineers.

At the Senate hearing, subcommittee chairman Senator Allen J. Elender (D-La.) complimented Consulting Engineers Council for its alertness in bringing such matters

(Continued on page 10)

HOFFMAN

COMPLETE LINE OF STEAM TRAPS

Hoffman Traps are specially designed and constructed to give economical removal of condensate from steam lines, long in-use life, and easy access for servicing. Traps illustrated are typical of Hoffman's complete line; each has removable cover, pin and seat for quick inspection and cleaning.

LOW, MEDIUM AND HIGH PRESSURE THERMOSTATIC TRAPS

all parts easily serviced* or replaced with Hoffman precision parts

* RENEWABLE THERMOSTAT, VALVE PIN & SEAT.

HOFFMAN ENGINEERS AND CRAFTSMEN OF YOUR HEALTH AND COMFORT

50 Series Float and Thermostatic Trap for Steam Systems and Equipment. For quick access and ease of servicing, all working parts of Hoffman Float and Thermostatic Traps are attached to trap's removable cover. Once installed, cleaning and repairing is possible without breaking pipe connections.

600 Series Inverted Bucket Traps for Intermittent Draining of Condensate and Air from Steam Equipment. Hoffman Bucket Traps are flexible in capacity; various sized valve seats are available for operation over a wide range of pressures. Valve seats and pins are easily changed to suit uses and service applications.

50 Series F & T Traps feature quick access to all working parts . . . low maintenance costs.

600 Series Bucket Traps feature straight-through pipe connections and changeable valve seats and pins.

HOFFMAN

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VALVES, TRAPS, VACUUM & CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS, STOCKED & SOLD BY LEADING WHOLESALERS OF HEATING & PLUMBING EQUIPMENT.

DEFENDS PRIVATE ENGINEERING

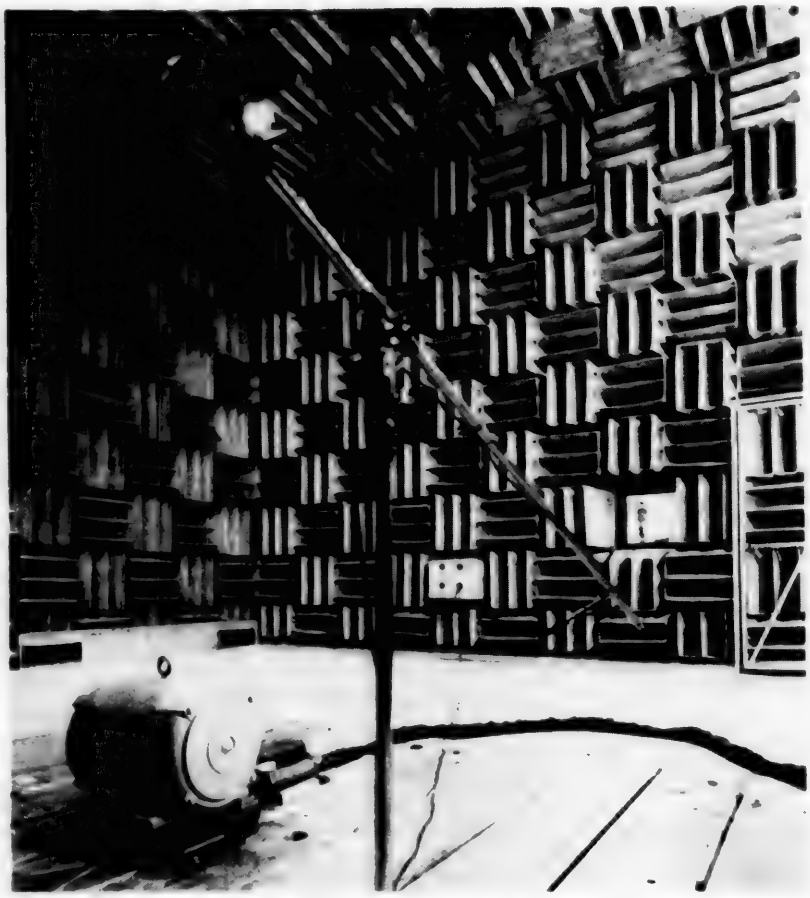
(Continued from page 8)

to the attention of the committee, even though its primary concern is with Corps of Engineer projects. Senator Warren G. Magnuson (D-Wash.) told the Council witnesses that he favored use of private enterprise in the engineering of federal projects.

In the House of Representatives, subcommittee chairman Clarence Cannon (D-Mo.) opened the hearing, but had to leave. Congressman Louis C. Rabaut (D-Mich.) assumed the Chair and continued the meeting.

Consultants vs. The Public?

In the course of discussion, Mr. Westcott was asked if CEC might not be more concerned about consultant's welfare than about what happens to the taxpayer. It was also suggested by subcommittee Member Edward P. Boland (D-Mass.) that CEC is, in reality, advocating that all government design be taken over by consultants. Mr. Westcott replied that his organization is, of course, interested in the welfare of the consultant but that its number one purpose, as outlined in its Articles of Incorporation, is to "protect the public." He also stated that CEC is not now, and never has, advocated the elimination of public engineering staffs.



NEW SOUND ROOM. A 30-hp motor is shown under test in a new 30x30x18 ft semianechoic chamber at the Westinghouse Electric Corporation's motor department in Buffalo, N. Y. Fiberglas wedges absorb energy for all of the frequency components above 100 cps. Above this frequency, the walls and ceiling become nonreflecting surfaces which insures highly accurate measurements on the radiated noise from the motor under test. Motor is isolated from floor and walls by an inertial block with a mass many times that of the machine.

MULTI-STORY CONSTRUCTION GETS NEW INDUSTRY LOOK

Reported in a recent survey of 197 companies by *Dun's Review & Modern Industry* is the fact that 41 of the companies contacted are giving thought to multi-story plants.

Such new equipment as vertical conveyors, etc., may help to lick the high cost of material handling which was responsible for the big trend to one-story plants during the past few years, according to some of the executives surveyed. Manufacturers of small, lightweight products are the most interested in high-rising construction, said the report, which will of course cut down the huge outlay for land required by the one-story structures.

Heat Pump Accelerating in Popularity; Big Northern Market Predicted in Decade

"Our own sales records and those for the air conditioning industry in general show that the heat pump is accelerating in popularity more rapidly than any other segment of our dynamic business, with the exception of residential air conditioning. Orders for heat pumps received during the first quarter of 1960 were approximately double the volume of the first quarter of 1959," reports Henry M. Haase, president of York Division of Borg-Warner Corporation.

In Syracuse, N. Y., Charles V. Fenn, vice-president of Carrier Corporation, predicted that widespread use of heat pumps in northern climates will be one of the significant developments in air conditioning during the next ten years.

Choice of Units Expanding

Both manufacturers are among a growing number who produce both large and small packaged heat pumps and large, field-assembled machinery for heat pump systems. The variety of such equipment continues to grow.

Mr. Haase chose to emphasize the packaged installations. He alluded to a recent installation at a shop-

(Continued on page 12)

Detroit's Magnificent COBO HALL

Giffels & Rossetti
Architects-Engineers

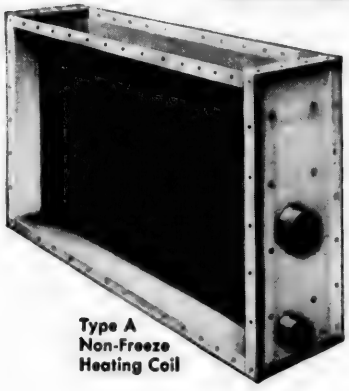
The O. W. Burke Company
General Contractor

Stanley Carter Company
Mechanical Contractor

Robert Irsay Company
Sheet Metal-Ventilation

Detroit Free Press
Photo by Tony Spina

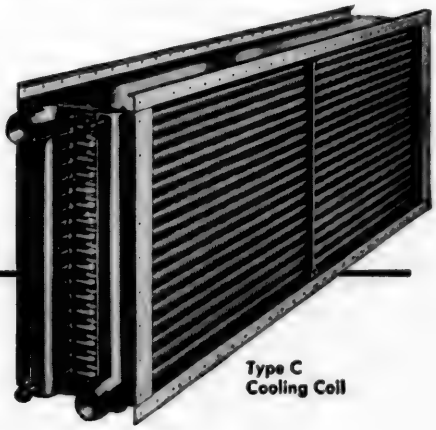
AEROFIN INSTALLED



Type A
Non-Freeze
Heating Coil

Modern smooth-fin design of Aerofin coils permits ample heat-exchange capacity in limited space–permits the use of high air velocities without turbulence or excessive resistance.

Aerofin performance data are laboratory and field proved. You can safely specify Aerofin coils at full published ratings.



Type C
Cooling Coil

AEROFIN CORPORATION

101 Greenway Ave., Syracuse 3, N.Y.

Aerofin is sold only by manufacturers of fan system apparatus. List on request.

ENGINEERING OFFICES IN PRINCIPAL CITIES

HEAT PUMP GAINING

(Continued from page 10)

ping center, where 235 tons of packages were used. Approximately a third of the units were heat pumps. Because of a decided trend toward the use of packages, his company is expanding the size of some units and will soon have available packaged heat pumps through 15 tons. These units are not to be confused with the compound air source, factory assembled, heat pumps with capacities from 50 to 150 tons of cooling.

Mr. Fenn chose to stress the field-assembled systems. He said his company is building refrigeration equipment with 1400 tons of cooling capacity for use with a heat pump installation in the new eight-story headquarters and research center of Allen-Bradley Company in Milwaukee. It will be the northernmost installation of this type of equipment in the country, he said.

Use Heat of People, Lighting

Recent developments in office planning, as well as in heat pump design, are making the application of heat pumps in northern climates practical and economical.

It is no longer necessary to confine heat pump marketing efforts to mild climates where warmer outside air or well water provides a supplemental source of heat, Mr. Fenn said. Wider use of intense lighting and business machines has created new sources of heat. In fact, he pointed out, so much interior heat is generated it is often necessary to simultaneously cool inside areas while heating outer offices.

At the Allen-Bradley installation, the heat pump system will heat the entire building by extracting surplus heat from people, lights and business machines in interior areas and transferring it to cooler offices located on the outer parts of the building.

Provide Service Hot Water

During warm weather three centrifugal refrigerating machines will cool the entire building. In winter they will cool some parts of the building and heat others, simultaneously. In addition they will warm two 75,000-gal. tanks of water for heating the building during weekends and at night when heat from people, lights and office machines is not available.

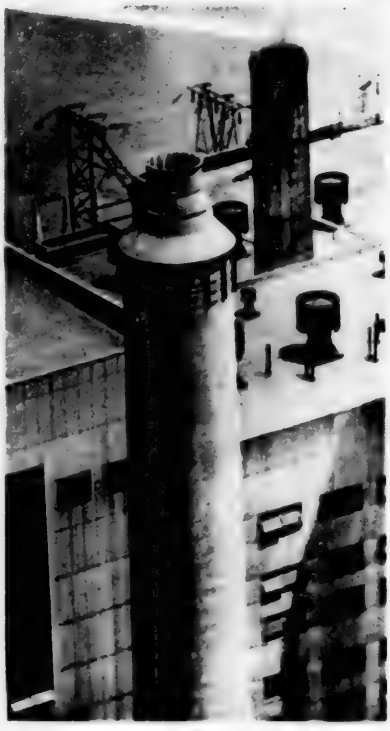
Squaw Valley Installation

As if to confirm Mr. Fenn's remarks, in Syracuse, Mr. Haase, in York, said that within the past several years the industrial heat pump has jumped the Mason-Dixon Line and demonstrated its applicability and reliability under a wide range of climatic conditions.

"In the glamour and excitement of the recent Winter Olympics at Squaw Valley many people were unaware that a heat pump was providing the refrigeration for the first artificial ice in Olympic history and freezing the largest expanse of man-made ice ever assembled at one spot," he said.

Heat removed from the ice and from the winter air was used to warm spectator areas in the big arena, heat domestic water, and melt up to 10 ft. of snow from the arena roof each month.

Stainless Steel Nozzle Atop Smokestack Increases Effective Height by 100 Feet



A novel 10-ton stainless steel nozzle, installed atop an existing 214-ft chimney has "stretched" the stack 100 ft.

The nozzle was devised for Pennsylvania Electric Company. It had decided that operations of its Seward Generating Station could be improved by having a higher chimney. To add an extension to the existing 214-ft stack was an obvious solution, but because the change had to be made during a normal shutdown period of three weeks and because the proposed 100-ft extension would be much more vulnerable in high winds, an alternate scheme was used.

Pre-fabricated by Aerotec Industries, Inc., Norwalk, Conn., the nozzle was attached to the top of the old chimney. By choking down the stack diameter the velocity of the exhaust gases was correspondingly increased, adding to effective stack height.

Double Lining Complicates Solution

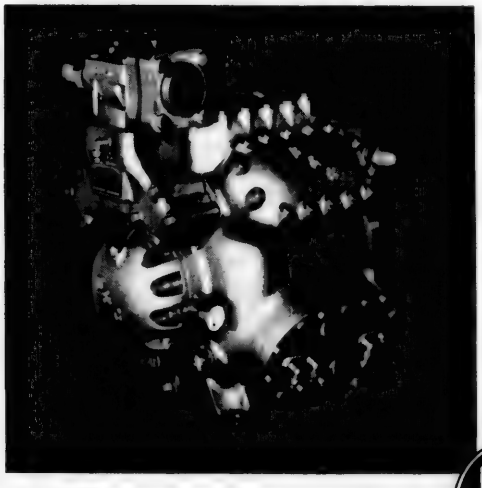
Design of the nozzle was complicated by the dual brick-concrete construction of the chimney. The 19-ft OD outer concrete shell is separated from the inner brick lining by a 6-inch air space. This clearance permits the chimney to sway under wind loads while the brick lining, except for thermal expansion, remains stationary. The problem was to attach the nozzle to the inner, gas-bearing brick liner without obstructing the annular 6-inch sway-clearance space between it and the concrete shell.

Solution was a double shell skirt on the nozzle. The inner skirt was attached to the brick liner by a flexible diaphragm, while the outer skirt was fastened to external supports on the concrete stack. Thus the total weight of the heavy nozzle was cantilevered from the loadbearing concrete, its inner surface mated with the brick liner, and there was no interference with the space between the two.

The flexible diaphragm used was

(Continued on page 14)

CHECKING OUT TWO 150 TON B&G® PACKAGE LIQUID COOLERS



All B&G Package Liquid Coolers and Condensing Units from 7½ to 150 tons are equipped with this new-design B&G Compressor.

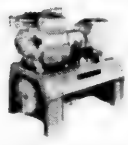
Here is the final and a very important stage in the production of B&G Package Liquid Coolers. When the four men finish this check-out, the units will be shipped with *everything mechanically correct and in accordance with the requirements of the order.*

These two 150 ton Package Liquid Coolers have completely wired panels with increment starting—*virtually plug-in units!* All major parts are made in the B&G plant...resulting in a unit unmatched for efficient operation and carrying one manufacturer's guarantee!

One of their outstanding features is the compressor, a masterpiece of advanced designing and precision manufacture. It establishes an entirely new standard of performance—smoother, quieter and with minimum vibration. All compressors have *one* bore—a few interchangeable parts will service all units, reducing maintenance problems.

BELL & GOSSETT
COMPANY
Dept. RGF-4, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

A FULL LINE OF REFRIGERATION AND AIR CONDITIONING "PACKAGES" AND COMPONENTS



B&G Condensing Unit

B&G Evaporator

B&G Centrifugal Pump

B&G Condenser

SMOKESTACK STRETCHER

(Continued from page 12)

woven from Du Pont Teflon fiber impregnated with Du Pont Viton synthetic rubber. This seal filled the need for flexibility, mechanical strength, and resistance to corrosive gases at 400 deg F.

With an additional fan pressure of 2 inches w.g., the nozzle projects 485,000 cfm of gas 100 ft or more above the chimney top—"stretching" its effective height virtually 50%.

TO INSTALL NEW OFFICIALS AT ASHRAE ANNUAL MEETING

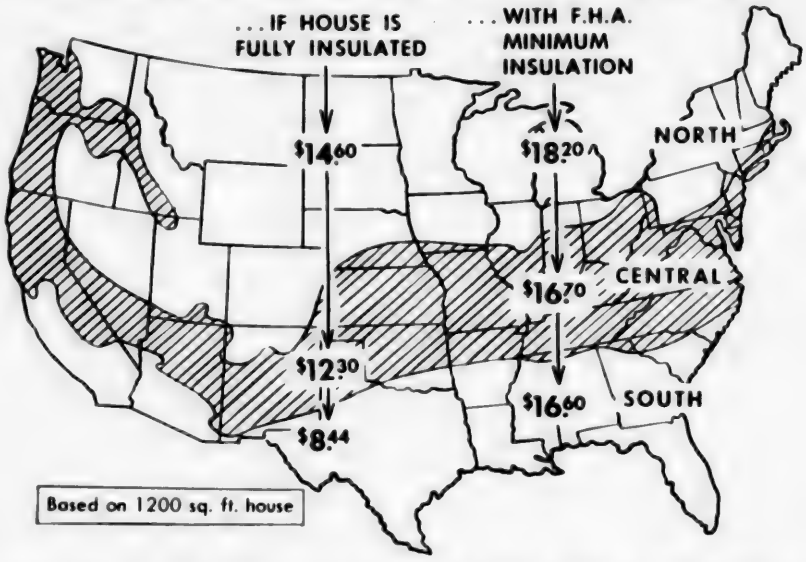
New officers will be installed by the American Society of Heating, Refrigerating and Air-Conditioning Engineers when it meets in Vancouver, B. C. June 13-15 for its 67th Annual Meeting.

Under the plan for consolidation by which ASHAE and ASRE became ASHRAE, Walter A. Grant will succeed D. D. Wile as president; R. H. Tull will become first vice-president, and John Everetts, Jr. will be second vice-president. As official nominee, it is likely that the next treasurer will be John E. Dube, ASHRAE officials state.

Walter A. Grant is vice-president, director of engineering, Carrier Corporation; R. H. Tull is manager, product engineering dept., Westinghouse Electric Corporation, Columbus, Ohio. John Everetts, Jr. is a consulting engineer, C. S. Leopold, Inc., Philadelphia, Pa. John E. Dube is president of Alco Valve Company.

According to an ASHRAE announcement, new members of the Board of Directors may be: W. J. Collins, Jr., consulting engineer, Oklahoma City, Okla.; J. F. Naylor, Jr., partner of J. F. Naylor & Company, Baton Rouge, La.; T. J. White, branch manager, American-Standard Industrial Div., San Francisco, Calif.; W. S. Harris, research professor, University of Illinois, Urbana, Ill.; W. L. McGrath, director of development, Carrier Corp., Syracuse, N. Y.; J. W. May, director of technical training for American Air Filter Co., Louisville, Ky.; A. Marin, professor of mechanical engineering, University of Michigan, Ann Arbor, Mich.; G. B. Rottman, consulting engineer, Greensboro, N. C.; and V. D. Wissmiller, manager of manufacturing sales, Minneapolis-Honeywell, Minneapolis, Minn.

WHAT YOUR MONTHLY HEATING AND COOLING COSTS SHOULD BE



MAT NO. 7. The above map of the United States is one of many pieces included in Air-Conditioning Clipsheet, a collection of editorial items for use by newspapers and released by Air Conditioning and Refrigeration Institute, Washington, D. C., for promotion of residential air conditioning.

Soviet Approach to Solar Heating Apparatus Differs from that of United States

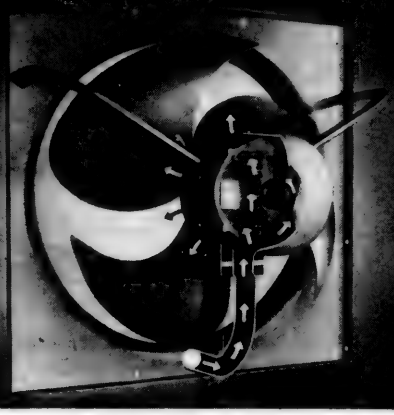
Soviet work in thermal solar devices has been characterized by Western scientists as unique because of its ambitious scale but otherwise neither startling nor significant, according to a report on Soviet utilization of solar energy distributed by Office of Technical Services, U.S. Department of Commerce, Washington, D.C.

There is no evidence that the Soviets have achieved significant reductions in cost or increases in efficiency in thermal devices, but they have directed their efforts toward the construction of large installations for public use.

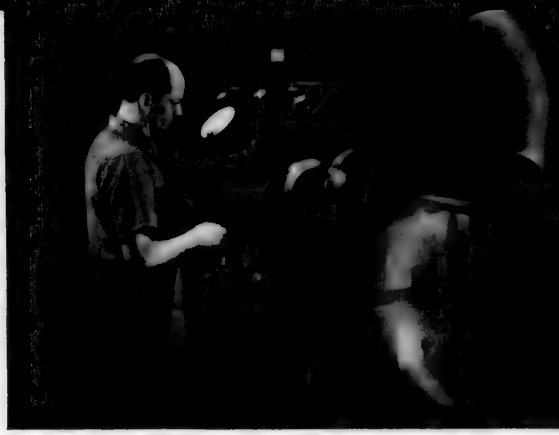
Soviet attempts to use flat plate collectors for individual house heating apparently was abandoned because the limited areas of sufficient sunshine required the dispersal of many units. Soviet attention has now been focussed upon large-scale installations using mirror concentrating systems in order to capitalize upon extremely favorable localized conditions. In order to achieve greater efficiency, the Soviets have decided that solar installations should provide heat in conjunction with other uses. Thus, in the summer they would be used for air-conditioning, producing ice, and so forth, as well as for charging the storage tanks of the solar heating system for use in the autumn and winter. This emphasis is in contrast to work in the United States which is largely directed toward improving the efficiency and reducing the cost of small-scale moderate-temperature installations.

In line with this large-scale multi-purpose approach, a scheme has been formulated for the building of a mammoth "helio-station" consisting of an elevated boiler surrounded by some 1,293 flat reflectors mounted on 23 concentric rail-

(Continued on page 16)



Cool, Clean, Quiet. Vent pipe sucks in outside air, *pressure-cools* permanently lubricated Ilg-built motors—designed to provide operating cost advantages of *open-type* motors plus the protection of *totally enclosed* types.



"Check-Out" Time. Every Ilg-built propeller fan wheel must pass rigid dynamic balancing "checks" before being direct-connected to Ilg-built self-cooled, 3-phase or permanent split-capacitor, single-phase motor.

New ILG Square Panel Propeller Fans move up to 37,550 CFM

You're looking at the new Ilg Type PF square panel propeller fans. Note the sturdily constructed 14-gauge steel mounting panel; the deep-throated streamlined orifice that increases fan efficiency; the choice of fan wheels—airfoil design blades (either five or nine) for operating against higher static pressures, and Ilg's patented Type "Q" blades for super-quiet operation on ordinary requirements.

Choice of three sizes: 36-, 42- and 48-inch fan wheels. All fans feature Ilg self-cooled motors, direct-connected, permanently lubricated. And all bear the Ilg "One-Name-Plate" pledge of performance. Write for Bulletin DB1-106.

ILG

ILG ELECTRIC VENTILATING COMPANY

2851 No. Pulaski Road, Chicago 41, Ill.
Offices in 59 Principal Cities
Member of Air Moving and Conditioning Association Inc. (AMCA)

SOVIET SOLAR HEATING

(Continued from page 14)

way lines. The individual reflectors, as well as the railroad cars on which they are mounted, are subject to revolution for focusing. This station is claimed to be capable of pumping water for irrigation in summer, draining swamps, and providing steam or hot water for heat in winter for a settlement of from 17,000 to 20,000 people. It is designed to produce 750 to 1,000 kilowatts of electricity and at the same time 19 tons of ice per hour or 9,000 gallons of distilled fresh water.

Despite a belief among Western workers in the field that this scheme was visionary and that the plant would never be built, steps toward its actual construction are evidently underway. It probably will be buit in the Ararat Valley in Armenia where the sun shines a relatively high number of hours per year, approximately 2,600.

SURVEY REVEALS SCOPE OF STEEL BOILER INDUSTRY

The steel heating and steel firebox boiler manufacturing industry, whose annual sales aggregate $100 million, is an important contributor to the national economy. It consumes substantial quantities of steel plate and boiler tubes, and it employs many people in its 94 plants. Nevertheless, detailed statistics with respect to the industry have not previously been available. To fill, at least partially, this statistical gap, the Building Materials Division of the Business and Defense Services Administration conducted a rather detailed survey of operations during 1957. The results of this survey are now being made available to the public.

The steel boiler industry is concentrated to a large extent in the Middle Atlantic and East North Central regions, where 64 of the total 94 operating plants were located in 1957.

Production is also concentrated in relatively few plants. For example, 11 plants, reporting an annual volume of more than $2.5 million, accounted for about 75% of total production in 1957. Thirteen plants, reporting a 1957 volume between $1 and 2.5 million, accounted for more than 21% of the total. In other words, 24 of the 94 plants were responsible for about 79% of the value of shipments in 1957.

In general, steel heating boilers having a heating surface of 177 sq ft and under are used in residential buildings, and boilers with ranges above that figure are used mostly in non-residential buildings.

B.R.I. SETS DATES FOR 1960 FALL CONFERENCES

Building Research Institute announces that November 14 through 16 are the scheduled days for the BRI 1960 Fall Conferences to be held at the Shoreham Hotel, Washington, D. C. Among program subjects will be a two-day presentation by the BRI Plastics Study Group on *Pre-Assembly of Large Components for Residential Construction*, it was announced.

Another two-day session will be programmed by the BRI Research Committee, one section of which is seen as being of considerable importance to industrial research workers. For the first time, an opportunity will be created for BRI members conducting industrial research projects to present papers on their respective tasks—projects which do not fit into the subject matter of any BRI conference programs planned for the near future. Any manufacturer who has a research project in progress or recently completed and who would like to bring it to the attention of the industry is invited to contact Harold Horowitz, BRI Assistant Director for Technical Programs, for details on how to participate in this program.

ANNOUNCE MILLER AWARD WINNER

James W. Galbreath, a senior in mechanical engineering from Indianapolis, was awarded the W. T. Miller prize for the current school year by the Indiana Chapter of the American Society of Heating and Air Conditioning Engineers, Prof. Frederick B. Morse, faculty advisor of the Purdue University student chapter, has announced.

The award established in 1956 was made to honor Professor Emeritus Miller of the Purdue staff, a long time leader in the field of heating and air conditioning. It consists of a permanent plaque hung in the Mechanical Engineering building on which the recipient's name is added each year, and a collection of approximately fifteen of the best books in the field of air conditioning, valued at approximately one hundred dollars.

Recipient is selected by a committee of the Indiana chapter and is based on the activity points of the student branch members. The committee interviews three of the students with the highest number of activity points and selects the recipient of the award. The Miller award was estabished to create a greater interest among students in heating and air conditioning.

Public Health Service Report Summarizes Hearings on Environmental Health

Aware that population growth, urbanization, and industrial expansion are rapidly and drastically changing the environment, the subcommittee of the House of Representatives Appropriation Committee which is responsible for public health appropriations has been giving increasing attention to environmental health problems for the past two years.

In 1959, during hearings on the 1960 budget, Congressman John E. Fogarty, chairman of the subcommittee, asked officials of the Public Health Service, U.S. Department of Health, Education and Welfare, to make a thorough study of environmental health problems and to recommend an efficient organization of facilities to deal with them. This study was submitted to the subcommittee in February, 1960. To

(Continued on page 135)

HEADROOM PROBLEMS

are but one of many reasons why leading gas companies now recommend a

for commercial-industrial GAS equipment

Proven in thousands of gas installations, Field does everything a draft diverter does—AND MORE—offering new simplicity, new flexibility, new precision in the control of draft.

If you design, specify, install or approve gas-fired equipment consult Field engineers for draft control recommendations.

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3 — LOAD FLEXIBILITY: With a **Field** firing rates can be varied — increased for increased loads, or decreased, and without loss of efficiency. Now gas is an even more flexible fuel.

4 — REDUCED CONVERSION COST: With a **Field** no change in breeching area is required when converting from coal or oil. Now it is quicker, simpler, less costly to convert to gas.

5 — REDUCED "START-UP" SPILLAGE: By avoiding loss of chimney prime, permitted with a diverter, **Field** minimizes the spillage caused by cold stack resistance.

6 — AUTOMATIC CONTROL: Field not only gives visual evidence of any spillage, but, when switch-equipped, spillage will automatically actuate virtually any response an engineer may specify. Thus **Field** permits still another refinement in the industry's meticulous handling of its fuel.

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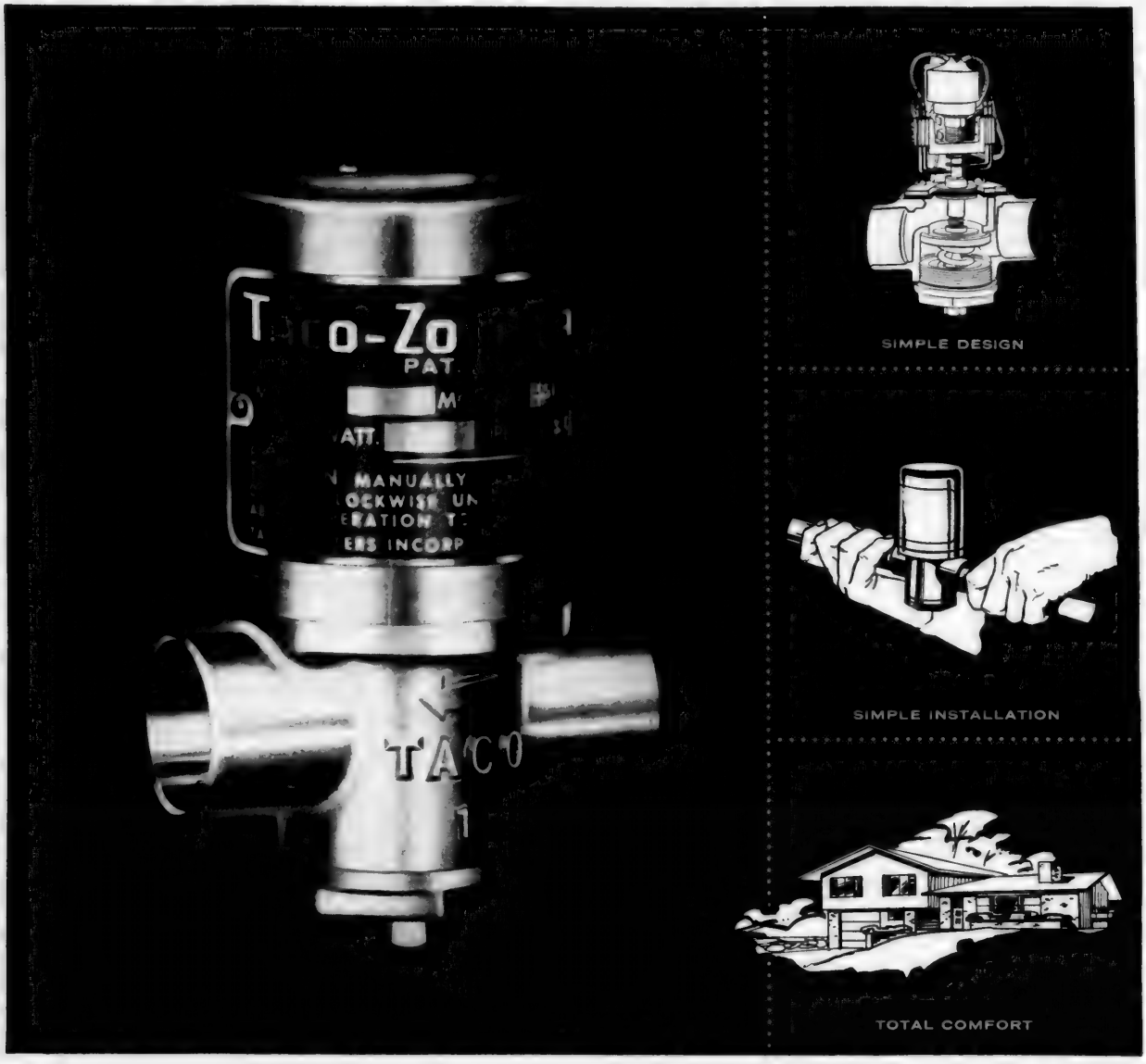
field



New zone valve matched to modern comfort...

Easy to install, foolproof in operation, the economical new TACO-Zone provides the positive, reliable control that today's water heating and cooling systems demand.

Small and compact, the TACO-Zone closes tightly; mounts in any position. Just open manually before sweating . . . no need to remove head . . . wire only three terminals! No motors, gears, cams or pinions to cause trouble, wear or noise. Operates at a low, safe 24 volts. Power element crushes foreign particles which often foul ordinary valves, and is easily replaced without draining the system.

For your next heating or cooling installation, "build in" total comfort and troublefree operation with TACO-Zones. Be sure you have specifications on other TACO Products . . . the *complete* line that's "efficiency engineered" to cover the field. Write TACO HEATERS, INCORPORATED, 1160 Cranston Street, Cranston 9, Rhode Island.

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...and be sure of the best!

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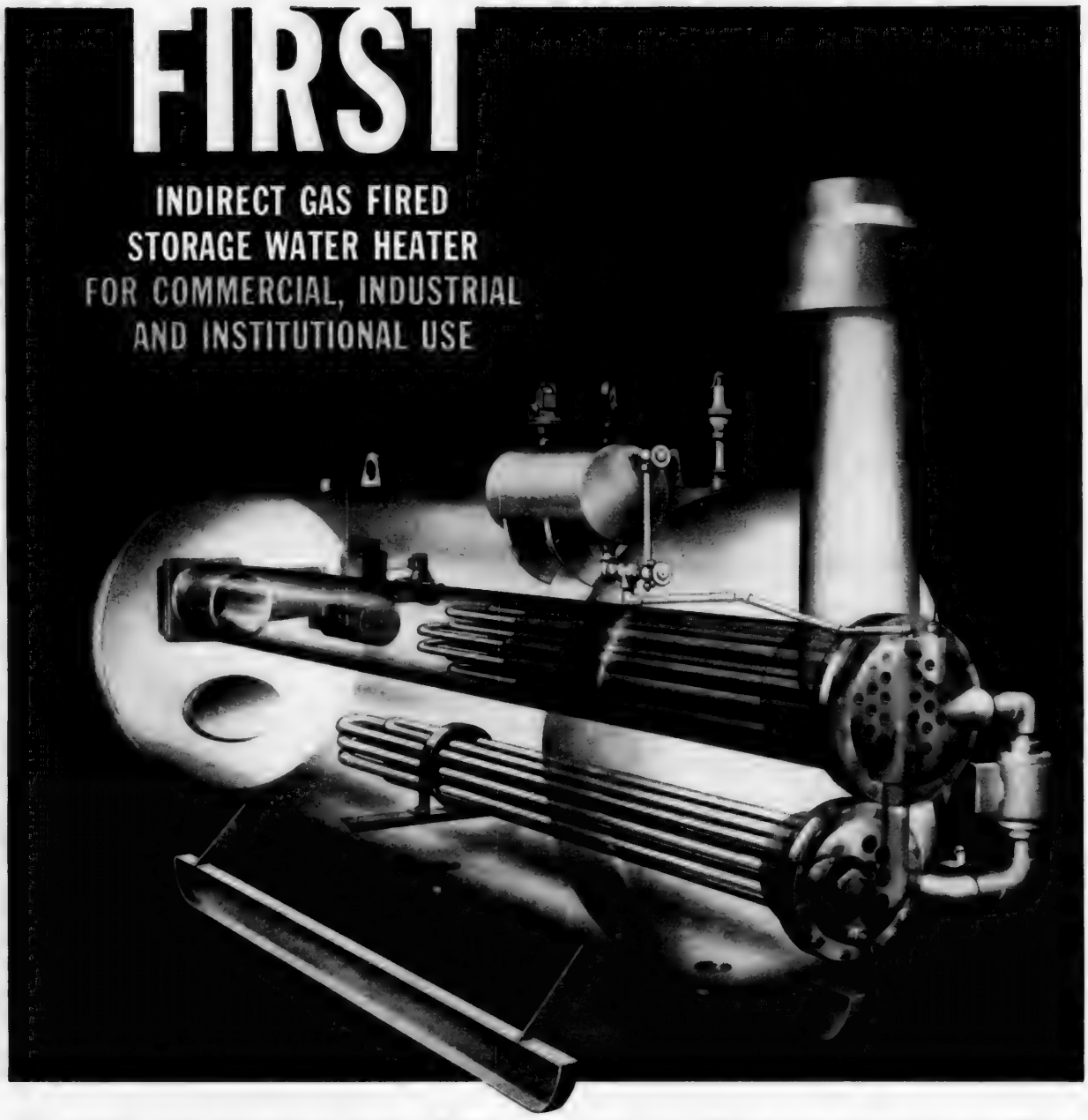
INDIRECT GAS FIRED STORAGE WATER HEATER FOR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL USE



No scaling • No drop-off in rated efficiency • No fuel waste • No on-the-job assembly • No complicated maintenance • No limitations on placement • Fully automatic • Copper heating surface

P-K SCALEFREE 230* is a unique rugged unit backed by P-K's 80 years of experience in building and designing quality water heating equipment. It heats water through hot intermediate distilled water. Transfer occurs below the temperature at which minerals that cause scaling precipitate. Efficiency remains unimpaired throughout service life. Linings of pre-Krete or copper are available to keep the unit free of rust and corrosion regardless of water conditions.

SCALEFREE 230 features a new P-K gas burner. It operates at maximum practical efficiency. Yet it gives almost noiseless service—does not rumble or boom on startup. This permits location almost anywhere in office buildings, institutions, schools, motels, etc.

SCALEFREE 230 is a complete fully automatic package that can be quickly set in place, hooked up and checked out. It is available in more than 100 storage and recovery combinations. Storage capacities range from 250 to 4000 gallons. Recovery sections range from 390,000 to 2,215,000 Btu. Write for catalog with full information.

*Patent pending

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A new line of Airfoil Bladed Fans with AMCA certified ratings

Now, from American-Standard Industrial Division comes a new line of Airfoil Bladed Fans that exceed 90% in mechanical efficiency. A completely new design, these fans carry AMCA certified ratings, and are built for both general ventilation and industrial process applications. They are available in 27″ thru 108¾″ wheel diameters—in single and double inlet designs, with volumes from 3000 to 500,000 cfm. Send for Bulletin A1103. American-Standard Industrial Division, Detroit 32, Mich. In Canada: American-Standard Products (Canada) Ltd., Toronto.

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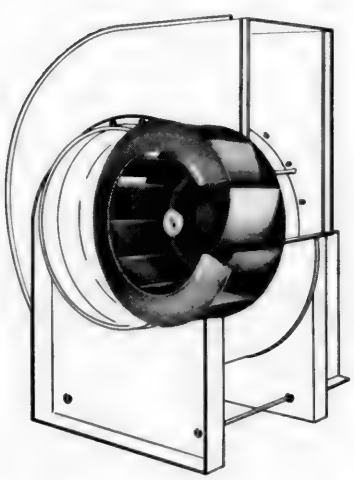

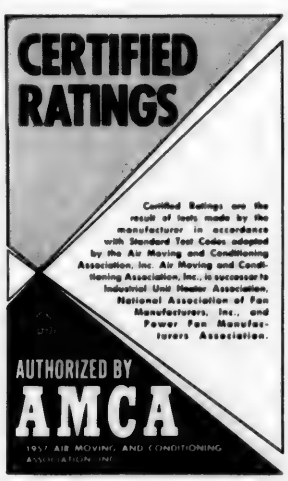
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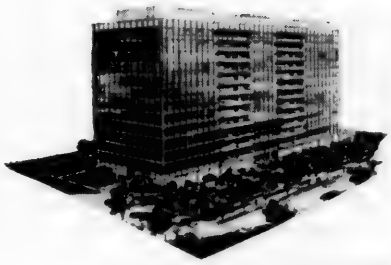
NEW MODINE FAN-COIL UNITS PERMIT FULL-ROOM DECORATING

IN BUILDINGS WITH CURTAIN WALLS

MODINE LOW-BOY *Airditioners*®

Special, nonstandard adaptations of the Low-Boy AIRditioner include provision for above-the-floor concealment of supply and return piping and for uninterrupted wall-to-wall installations. Because quantity, delivery and price are determined on an individual basis, please contact your Modine sales representative or write to the company.



550 LOW-BOYS IN LAKE MEADOWS 600—Modine Low-Boys are providing year-round comfort for residents of Chicago's newest luxury apartment building . . . Lake Meadows 600. This gleaming, glass-enveloped, 12-story and penthouse building overlooks Lake Michigan . . . contains 140 apartments. Owners: New York Life Insurance Co.; Architects and Engineers: Skidmore, Owings & Merrill; Mechanical Contractor: Advance Heating & Air-Conditioning Corp.; General Contractor: Turner Construction Co.

OR FLOOR-TO-CEILING WINDOWS

Modine Low-Boys are never in the way . . . of architect, decorator or tenant. They crouch close to the floor as they heat, cool, filter and dehumidify. The 14½" height is almost a *full foot lower* than other fan-coil units. Although midgets in size, Low-Boys are giants in performance. Using hot or chilled water from a central source, they deliver year-round comfort . . . quietly, economically. They're individually controlled thermostatically or manually. And response is instantaneous!

Handsome Low-Boy enclosures blend with the decor of any room. They're available in 44-, 52-, 68- and 96-inch lengths . . . in six decorator colors: ivory, putty, rose beige, sepia, almond green and dark jade green. Bulletin 760B has complete Low-Boy details. The coupon will send your copy on its way.

A-1411

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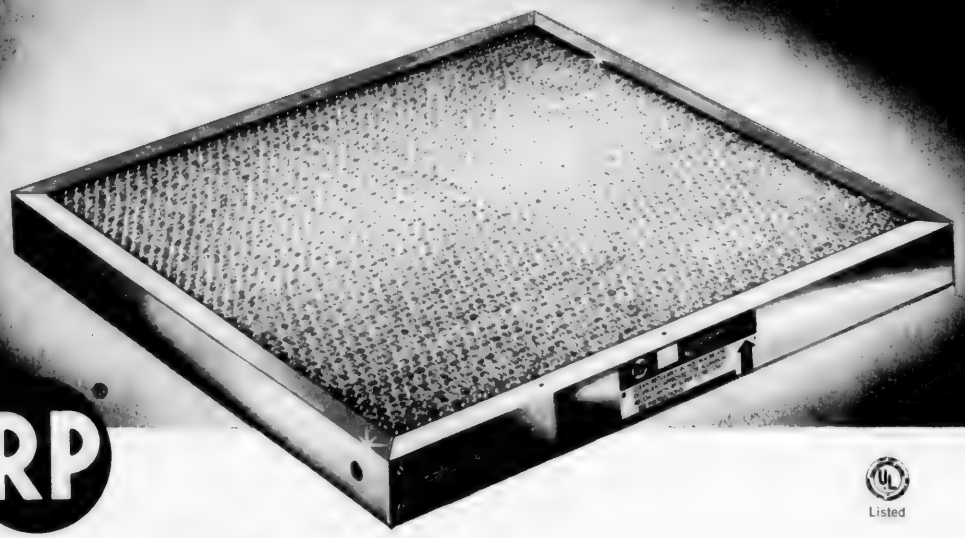

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Multi-Velocity INDUSTRIAL AIR FILTER

FOR HEATING OR AIR CONDITIONING

✶ **ALUMINUM** construction...rust-proof...corrosion-resistant. Eliminates need for expensive, heavy structural design in filter bank construction.

✶ **EASY TO HANDLE** Light-weight permits carrying, washing and installing of many more filters per hour.

✶ **EASY TO CLEAN** Lint and dirt are easily flushed off with water because of water soluble Super Filter Coat (the adhesive with the built-in detergent).

✶ **DEPTH LOADING** Designed to minimize surface loading, with depth loading accomplished through successive layers of slit and expanded aluminum, and varying baffle sizes.

✶ **REMOVES ODORS** Revolutionary R P Super Filter Coat adhesive adds odor removal to the normal dirt-trapping properties of R P Industrial Air Filters —with no increase in resistance—at *no* extra cost!

✶ **GERMICIDAL** Super Filter Coat adhesive contains Hexachlorophene, the well-known bacteria destroying agent.

✶ **LOWER RESISTANCE** Unique baffle design permits maximum air passage...more uniform dust collection within the filter depth.

✶ **HIGHER EFFICIENCY** Scientifically staggered pattern of flat baffles sets up a controlled turbulence that centrifuges dust and odor particles onto the adhesive for maximum efficiency.

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TOM JOB

A standard type Skidmore Pump will meet the exacting requirements

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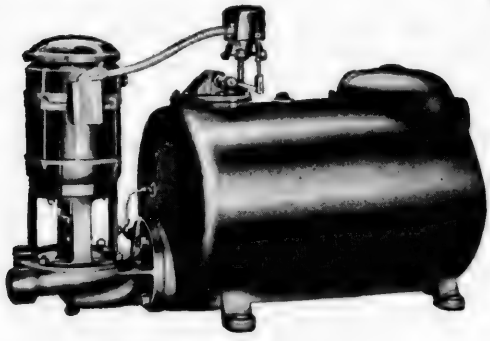
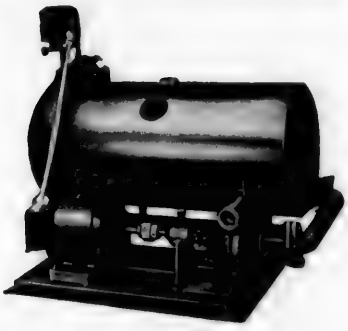
● **TYPE "VC" PUMP**

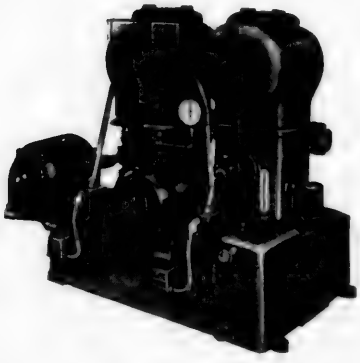
Furnished in single or duplex units. Bulletin 10-B





● **TYPE HS PUMP**

Furnished in single or duplex units. Bulletin 14-B



● **TYPE CCVS PUMP**

Three new single units, two duplex. Bulletin 21-C

● **VACUUM PUMP**

Furnished in single or duplex units. Maintained efficiency. Bulletin 9-B

Let Skidmore assist you in your heating pump plans. Write for bulletins.

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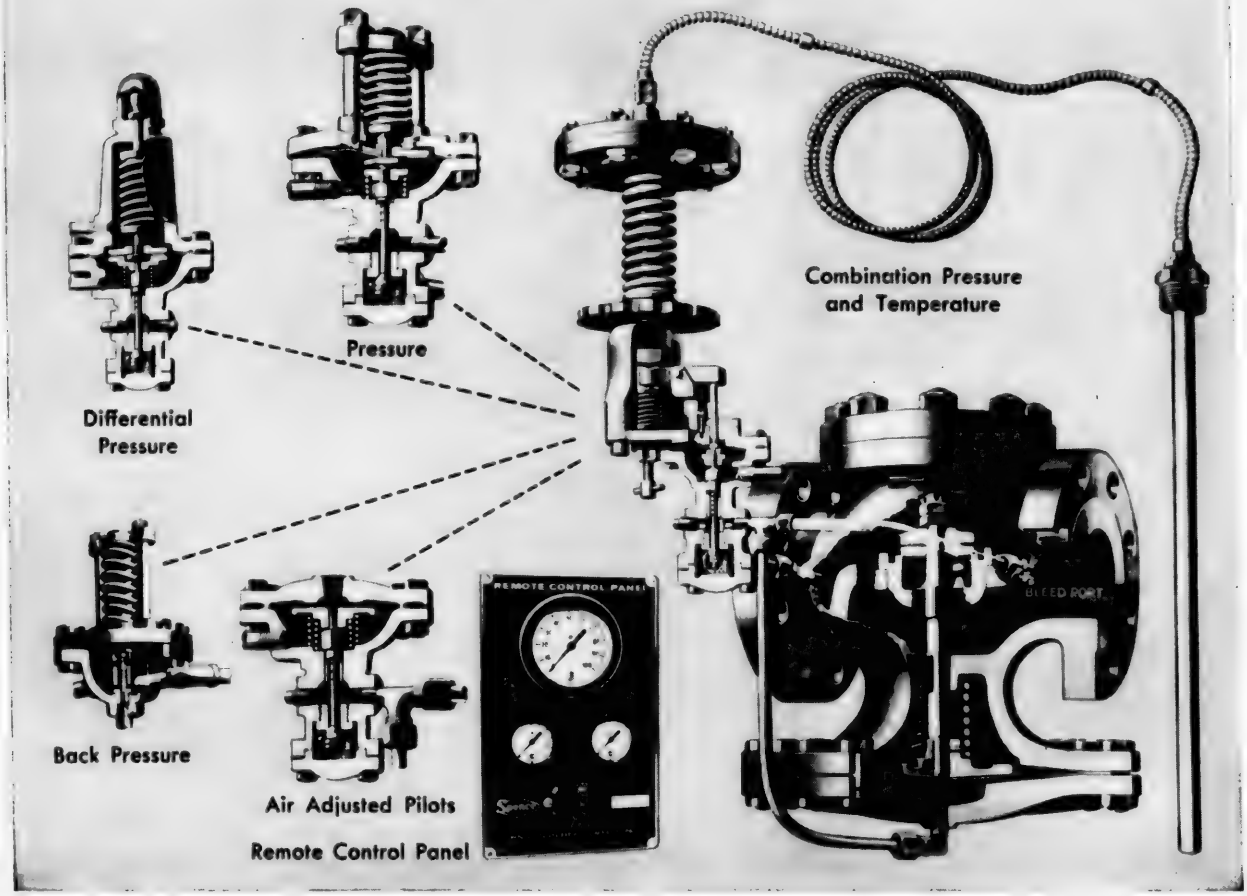
Choose with Confidence!

All Pilots Fit All Main Valve Sizes Downtime, Maintenance, Inventory Reduced



Let's start off by admitting there's no such thing as a "maintenance-free" regulating valve. Any valve that automatically controls temperatures or pressures within close limits can be affected by dirt in steam lines.

If trouble does develop, engineers want a regulator they can get back on the line — fast. That's one reason why more engineers are standardizing on Spence Regulating Valves with externally mounted pilots. The simple test of disconnecting the external bends establishes whether the trouble is in the main valve or the pilot.

If the main valve is the trouble spot, it can be maintained without removing the valve body from the line. If the pilot is the trouble spot, it is easily removed for cleaning. However, if production downtime is a strong factor, the fastest method is to install a spare pilot and it is inexpensive.

All Spence pilots fit all sizes of Spence main valves. If you have twenty pressure regulators, for instance, all you need is *one spare pilot*. It will fit all main valve sizes from ¼" to 12".

Another advantage of the Spence design is the external pilot is interchangeable. You can change the function of a regulator by merely changing the pilot. In many plants this can represent an important factor in reduced inventory costs because you only carry a few inexpensive extra pilots instead of complete regulators. Obviously, there is also a considerable savings in labor costs when a valve can be converted, in the line, from a temperature regulator to any one of various pressure regulators.

The pictures above show a few of Spence's wide line of automatic regulators. For more information write for Bulletin TE.

SPENCE ENGINEERING COMPANY, INC.
Walden, New York SE-148

Dual Purpose Unit

IN THE BUENSOD FAMILY

of air conditioning apparatus

Although Buensod-Stacey is probably best known for its pioneering and development of dual-duct air conditioning system devices, that's not all we do. Far from it, the Buensod family of air conditioning products includes such items as Dual Purpose Units, air washers, automatic dampers, humidifiers and dehumidifiers, louvers, spray nozzles, and, of course, dual-duct and single duct units. Every one has been engineered to provide maximum on-the-job performance. There's probably a spot for Buensod equipment in your next installation. Write for complete information.

BUENSOD

Buensod-Stacey Corp., 45 West 18th Street • New York 11, N. Y.

BUENSOD STACEY

Subsidiary of Aeronca Manufacturing Corporation

Architect's rendering of Alfred Speer Village, Public Housing [illegible] are used in this as well as in the Authority's Vreeland Village Project at Passaic, N. J. Sarcotherm Heating Control Systems [illegible] Kelly & Gruzen were architects and engineers for both projects.

"THIS HOUSING PROJECT'S SARCOTHERM VACUUM HEATING CONTROL SYSTEM HAS BEEN EXCELLENT IN ALL RESPECTS..."

Behind this report of complete satisfaction from the Passaic, New Jersey, Housing Authority are the basic reasons why it pays to install a Sarcotherm Outdoor Controlled Weather-Compensating System. These systems not only provide the precise temperature control so critical in housing projects, but are easy to install and operate, and never waste fuel. Sarcotherm's advantages cost no more, and the inherently simple design of the system keeps maintenance costs to a minimum.

This project involved two installations, Alfred Speer Village, heated by steam, and Vreeland Village, heated by hot water. Both were directed by the Passaic Housing Authority and designed by Kelly and Gruzen Architects and Engineers. Sarcotherm engineers cooperated with their architects, engineers and contractors to achieve best results.

On projects like this, Sarcotherm saves time, effort and money. A minimum of wiring is required which makes for simpler, faster hook-ups. In operation, a Sarcotherm system cuts fuel costs through precise metering of delivered heat, yet an exact degree of comfort is provided regardless of outside temperatures. Operating personnel can easily make adjustments to maintain accurate specified temperature levels.

All Sarcotherm components are built to the highest standards in the industry for long-lived reliability. In addition, a Sarcotherm contract brings you the advantages of single-source responsibility: you get your complete control system as well as heating specialties and accessories from a single centralized supplier. Write for Sarcotherm Control Catalog. Specify steam or hot water.

SARCOTHERM

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AN AFFILIATE OF SARCO COMPANY, INC.
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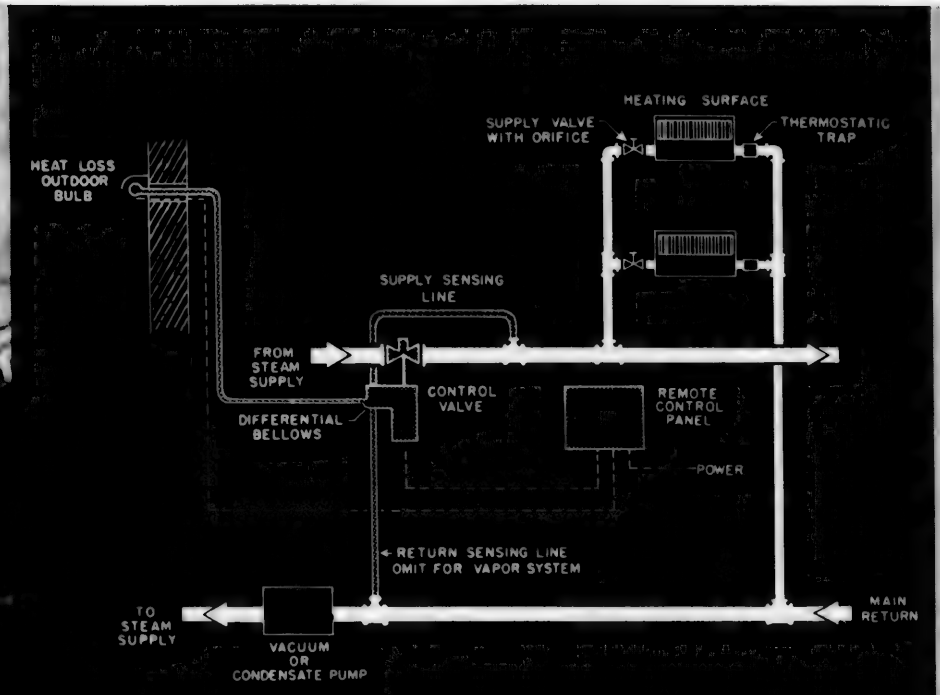
PLANT: BETHLEHEM, PA.



Here are just a few of the many other

PUBLIC HOUSING PROJECTS using SARCOTHERM WEATHER-COMPENSATING HEATING CONTROL SYSTEMS

Name	Number of Zones	Installed
Marvine Village Bethlehem, Pa.	82	1952
Cherry Hills Baltimore, Md.	53	1956
Hanover Acres Allentown, Pa.	35	1959
Beardsley Terrace Bridgeport, Conn.	16	1953
Fayette County Housing Fayette Co., Pa.	15	1951
Rome Housing Rome, N. Y.	8	1952
Norwalk Project No. 1 Norwalk, Conn.	8	1950
Norwalk Project No. 2 Norwalk, Conn.	2	1952
Commodore Perry Buffalo, N. Y.	6	1956
Scranton Housing Scranton, Pa.	6	1953
Pequonnock Housing Bridgeport, Conn.	4	1954
Long Branch Housing Long Branch, N. J.	3	1956
Waterbury Housing Waterbury, Conn.	3	1955
Port Chester Project No. 1 Port Chester, N. Y.	2	1949
Port Chester Project No. 2 Port Chester, N. Y.	2	1951

...AND THERE'S BEEN MINIMUM MAINTENANCE," SAYS THE PROJECT ENGINEER... AFTER 7 YEARS OF TROUBLE-FREE OPERATION

Year-in, year-out heating comfort for these housing projects is only part of the story. Maintenance of the Sarcotherm Heating Control System is another, and the Passaic, New Jersey Housing Authority says that only a minimum of service has been required. Reason: Fewer parts and simplified wiring.

Sarcotherm plans for your heating system's future from the very beginning. For example, Sarcotherm always unit packs and tags every component, prepares complete working drawings, and keys all parts to the drawings. Trained Sarcotherm personnel contribute to the speed and efficiency of the work on the job, make final adjustments, and take the system through start up. Sarcotherm provides complete operating manuals and instructs the people who will operate the system. This not only reduces installation time, but sets the stage for trouble-free operation in years to come.

All projects like those described here can benefit from Sarcotherm's more than half century of specialized experience in steam and hot water systems. Get more information about Sarcotherm on-the-job cooperation, and how it contributes to the speed and efficiency of installation and initial adjustment. Write for your copy of the Complete Control System Catalog. Specify Steam or Hot Water.

FOR COMPLETE CONTROL SYSTEM CATALOG write Sarcotherm Controls, Inc., 635 Madison Avenue, New York 22, N. Y.

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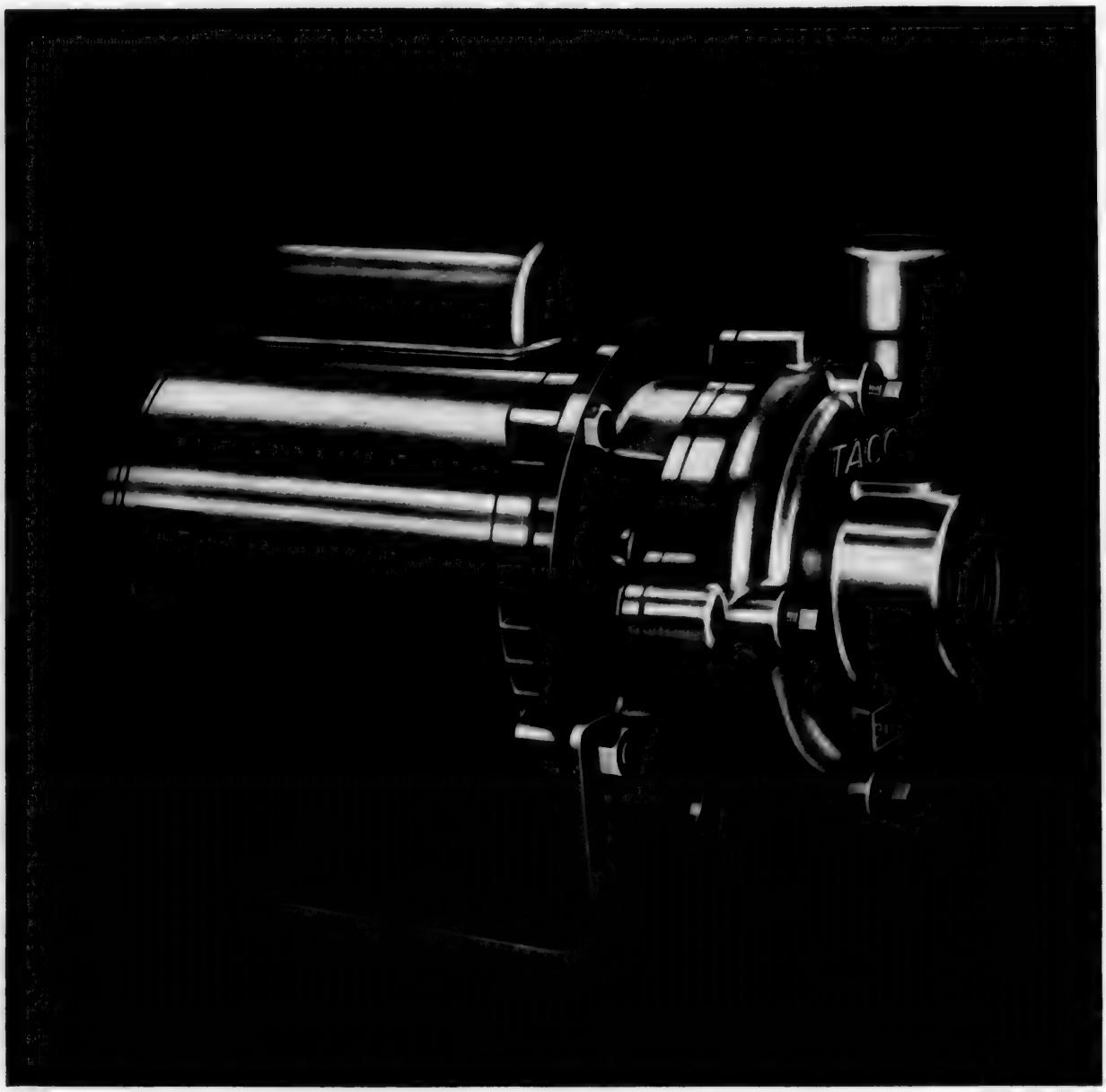

Lubricate in 1970

That's right. If you put the TACO General Purpose Pump into operation today, you can forget about lubricating it until 1970! Actually the motor is permanently lubricated, but we recommend re-packing the bearings every ten years. No other parts of this rugged pump *require* lubrication! Freedom from lubrication worries is just one of many reasons why the TACO General Purpose Pump is ideal for use in air conditioning systems, commercial installations, laundry equipment, swimming pools, and hundreds of other applications. Design has been so simplified that any servicing necessary can be done in the field, with tools ordinarily carried by all service men. Compact and lightweight, the TACO General Purpose Pump saves installation time too. And its dependable performance saves costly "call backs" In short, it provides a better all around return for your investment. Get complete specifications now. All products in the *complete* TACO Line are "efficiency engineered" to provide maximum performance and economy in all your installations. Write TACO HEATERS, INCORPORATED, 1160 Cranston Street, Cranston 9, Rhode Island.

TACO

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Handling Hot Fumes? Bifurcate 'em!

A protective housing shields a DEBOTHEZAT Bifurcator motor from contact with hot and corrosive fumes. Special alloys for housings and fan wheels are available for extremely corrosive fumes. The result: smoother operation and lowered motor maintenance costs. In-the-duct installation of DEBOTHEZAT Bifurcator Fans saves valuable space and ends sharp-corner deflection of exhaust flow. Friction is reduced and velocity increased.

Direct-drive DEBOTHEZAT Bifurcator Fans economize fume removal problems in a wide variety of applications. Contact a DEBOTHEZAT engineer now or write Dept. ACH-660.

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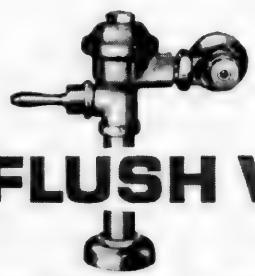
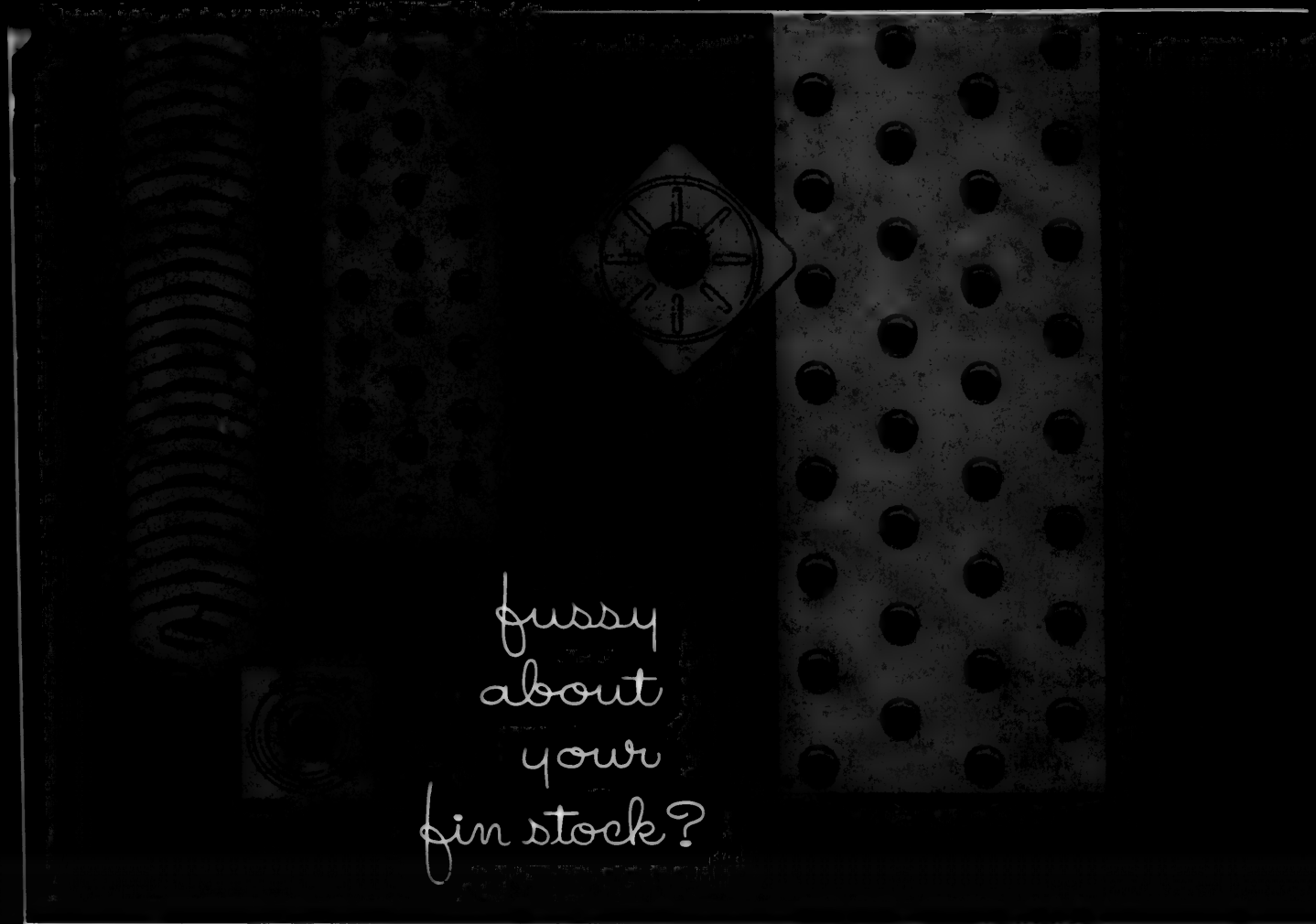
• The non-hold-open feature is a product of Sloan research. Its purpose is to prevent the waste of water—either accidentally or maliciously. A Sloan Flush Valve will complete its cycle and shut off automatically whether the handle is held or released.

• Non-hold-open is a standard Sloan feature—another bonus of quality you expect from Sloan. And since Sloan quality costs no more—why not make sure you get it.



SLOAN FLUSH VALVES

SLOAN VALVE COMPANY • 4300 WEST LAKE STREET • CHICAGO 24, ILLINOIS



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Corrosion-resistant, fireproof vents

...with eye-appeal!

Vertical exposed flues of Transite Vent Pipe form eye-catching design on new Rockwell Manufacturing Co. installation

A GLANCE at this attractive new plant tells you that the material used for the exhaust flues is vital—vital to the plant's appearance . . . vital to maintenance economy.

That's why Walter Wagner & Partners, Architects & Engineers of Fresno, Calif., chose Transite Industrial Vent Pipe to exhaust corrosive fumes from the plant's small parts casting pots.

Made of asbestos-cement, Transite® retains its good appearance through years of weather. *Saves on upkeep*, because it never needs painting or preservative coating. *Saves on maintenance*, because it resists the attack of most gases, mists, fumes, and dusts. Installed indoors or out, Transite offers you these same appearance and maintenance-free advantages.

Transite also offers many layout and installation economies. A wide variety of fittings, diameters and lengths makes it readily adaptable to every venting service. Ease of cutting and handling add further to installation savings.

Let us send you DS-336—a 24-page brochure on Transite Industrial Vent Pipe. Write Johns-Manville, Box 14 HV, New York 16, N. Y. In Canada, Port Credit, Ontario.

Architects & Engineers: Walter Wagner & Partners, Fresno, Calif. Mechanical Contractor: Robert Wright Plumbing, Porterville, Calif.

New plant at Porterville, Calif., has twenty-two 8" Transite exhaust flues. Joined by 14-gauge metal bands, each flue has clean, unbroken appearance.

JOHNS-MANVILLE JOHNS MANVILLE JM PRODUCTS

HIGH PRESSURE PUMPING

WITHOUT SACRIFICING EFFICIENCY! Write for Bulletin 980 and see how Buffalo combines efficiency with rugged strength in these 2 and 4 stage pumps for boiler feed and other clear water, high-pressure jobs.

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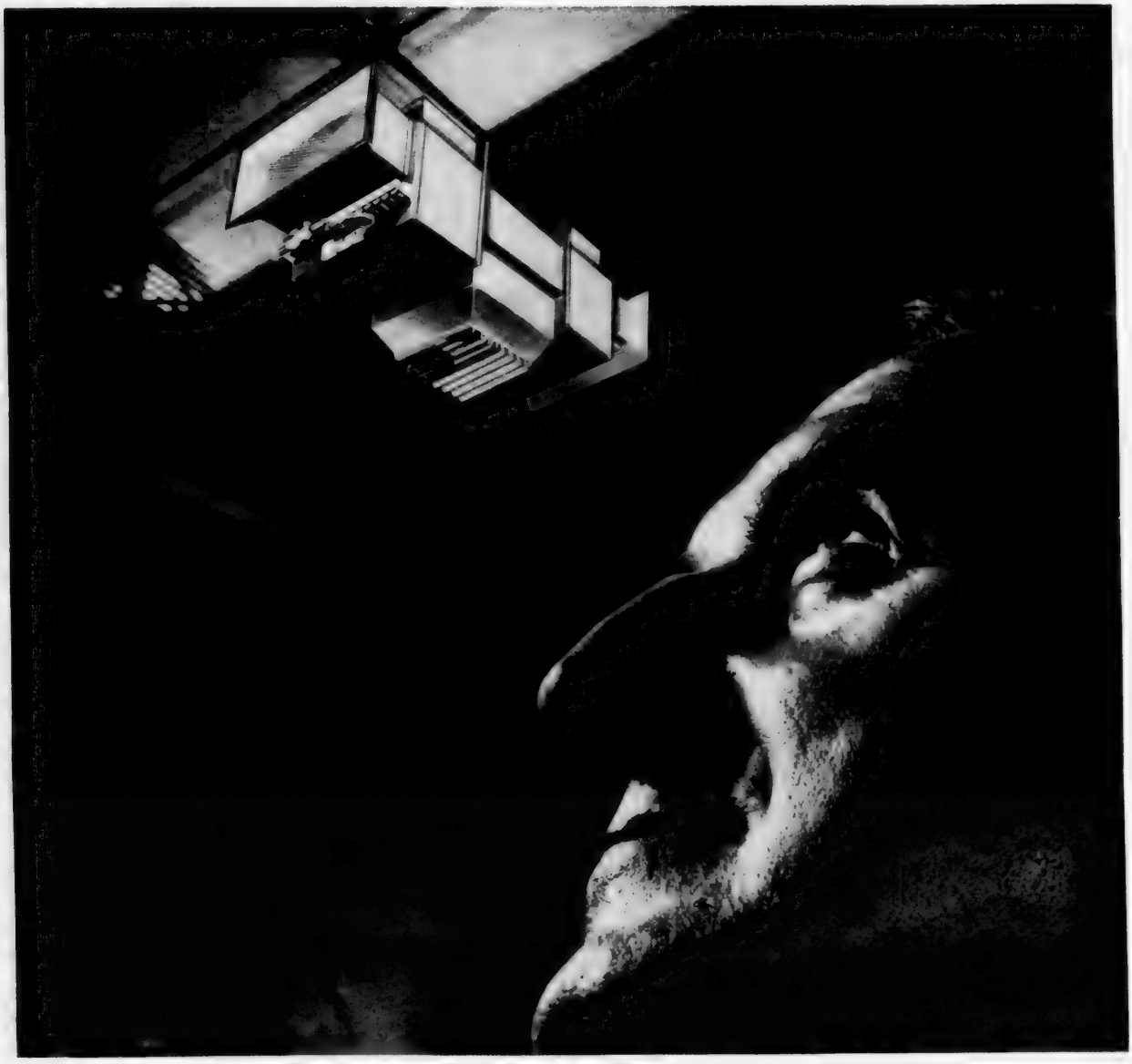
A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID



TOUGH BUYERS DEMAND REZNOR FIVE-WAY HEATERS

to project heat where needed on "difficult" jobs... with no waste!

When cranes, production machinery or huge inventory stacks require abnormally high heater placement, you *have* to be a "tough buyer" to do a proper heating job! You have to deliver a unit that will project heat where it's needed . . . with no waste of fuel *or* heat. That's why so many heating contractors now demand the new Reznor Five-Way Heater, which projects heat downward, even from a height of 40 feet, to the spot where heat is needed, and (with the optional 5-way diffuser) in as many as five directions at once!

LOWER FUEL COSTS—By spotting heat accurately, the Five-Way Heater maintains complete comfort with less fuel; keeps fuel bills low.

LOWER INSTALLATION COSTS—The entire assembly installs quickly, requiring only gas, flue and power connections.

Available with aluminized or stainless steel heating elements and gas modulation. Electric ignition is optional.

For information, phone your Reznor distributor, or write Reznor Manufacturing Co., Dept. 64C, Mercer, Pa.

The heating world is full of tough buyers; that's why Reznor is the world's largest selling direct-fired heater!

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"THE TOUGH BUYERS' LINE"

IN TUBING—Nothing Beats Copper!
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Specify
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Ideal in

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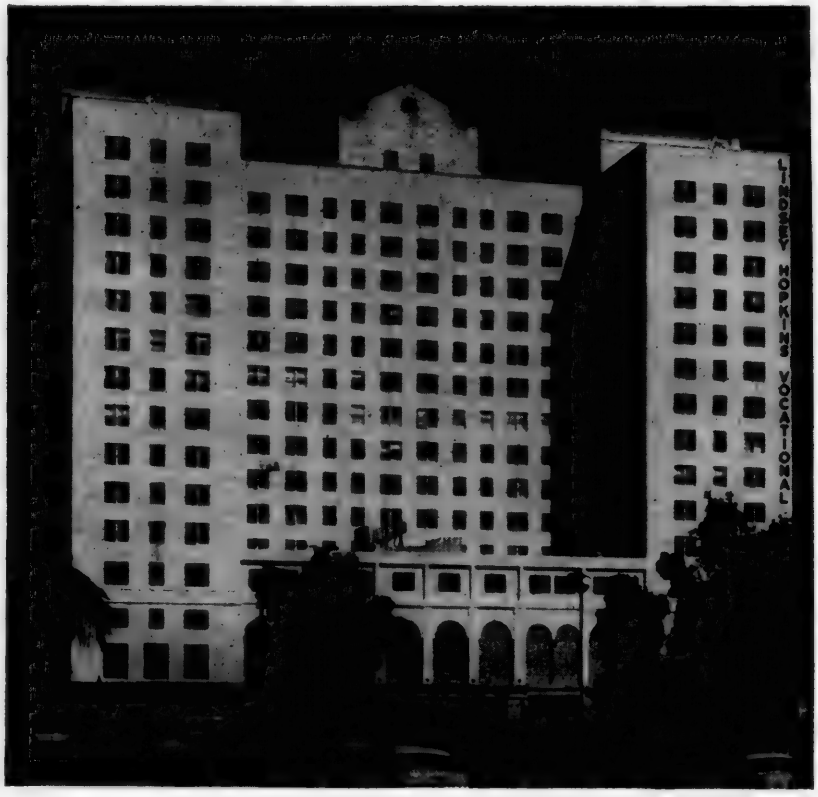

ARCHITECT: Curtis E. Haley, Coral Gables, Fla.

CONSULTING ENGINEERS: J. E. Curley & Associates, Coral Gables, Fla.

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Vertical Multizone Unit

Thermal Units Air-Condition Huge Vocational School

The Lindsey Hopkins Vocational School in Miami, Florida, is believed to be the nation's largest and most successful adult vocational school with an enrollment of about 39,000. The building pictured above houses most of the classes which meet during the daytime and evening. Fifteen of Thermal Engineering's horizontal central plant type and multizone air conditioners maintain the comfort level in these busy classrooms.

From Presque Isle, Maine to Miami, Florida, and across the nation to the Pacific, Thermal Engineering's equipment is meeting the demand for year 'round comfort in all types of structures, under many varying climatic conditions. Its performance and quality assure architects and engineers that this equipment can be specified with confidence.

For finer air conditioning and ventilating equipment for every climate to fit all architectural requirements, you can specify Thermal. The Thermal line includes central plant and multizone conditioners, sprayed coil units, heating and ventilating units, heating and cooling coils and air-cooled condensers. We will be glad to furnish you our complete catalog.

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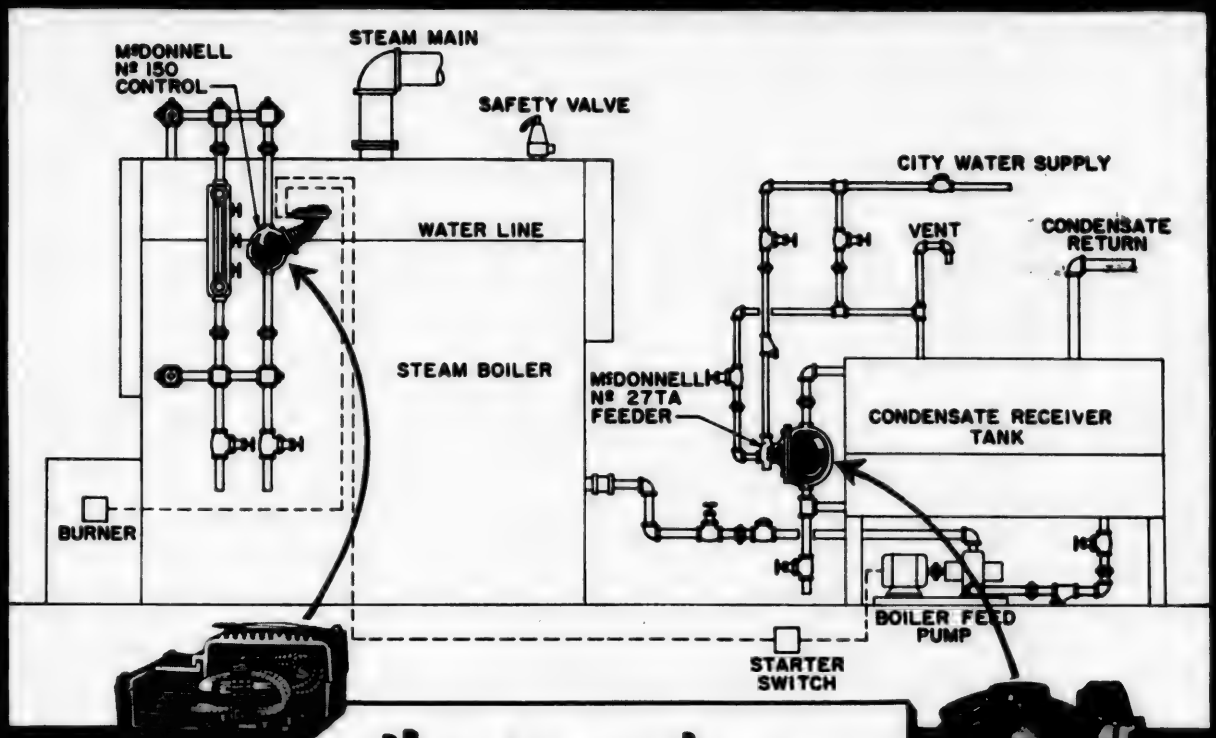
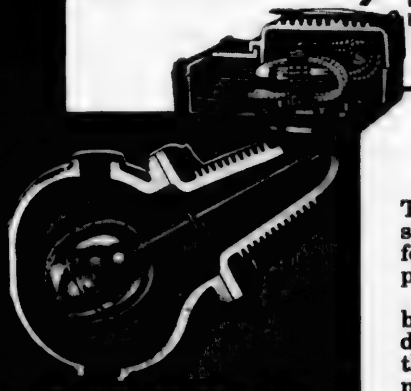
The TWO BEST FRIENDS any boiler ever had





How to use them—

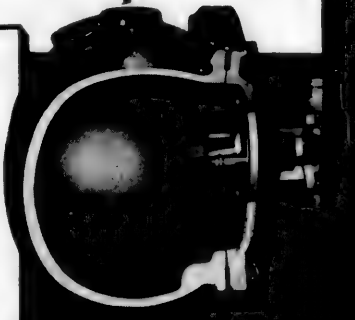
The drawing shows the simple hook-up that has solved the tough problem of water level control for medium pressure boilers... boilers with steam pressures up to 150 psi.

McDonnell No. 150 on the boiler controls the boiler feed pump as it should be controlled—directly *from* the boiler water level. This holds the water level within the close limits that assure maximum steaming efficiency and fuel economy.

McDonnell No. 27TA Water Feeder, installed on the receiver tank, adds the necessary make-up water as required by the system.

The low water cut-off and alarm in the No. 150 provides circuits for cutting off burner and sounding low water alarm—a final safeguard from emergency conditions such as current interruption in the pump circuit or failure of make-up water supply.

Yes, this is the most thoroughly proved, widely used hook-up of its kind, adaptable to every condition. McDonnell Water Level Controls are available for steam boilers up to 250 psi. and for hot water space heating boilers. *Write for information.*



THE PUMP CONTROL AND LOW WATER CUT-OFF:
McDONNELL No. 150

Used as pump control, low water fuel cut-off and low water alarm. Built in the McDonnell tradition to stand up under the temperatures and pressures such a control encounters. Underwriters' listed.

THE MAKE-UP WATER FEEDER:
McDONNELL No. 27TA

A float-operated make-up water feeder with the large feeding capacity and sturdy construction essential to maintain the required water level in receiving tanks. Other types for all needs.

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BOILER WATER FEEDERS • LOW WATER FUEL CUT-OFFS • PUMP CONTROLLERS • RELIEF VALVES • FLOW SWITCHES • RELATED LIQUID LEVEL CONTROLS FOR TANKS, STILLS, AIR CONDITIONING SYSTEMS

Mr. Paul E. Grunau, center, talking over an installation problem with Mr. Morton R. Spence, left, of Rundle-Spence, National Tube Distributor, and Mr. Leslie Smith, National Tube's representative in Milwaukee. This type of round-table discussion indicates the close relationship between contractor, National Tube Distributor and National Tube.

"We had only 14 hours to repair a cooling system and save $100,000 in perishable foods—

our National Tube Distributor helped us finish the job in 12 hours,"

says Mr. Paul E. Grunau, Secretary-Treasurer, Paul J. Grunau Company, Mechanical Contractors, Milwaukee, Wisconsin

"We got this emergency job late at night," says Mr. Grunau. "Yet, our National Tube Distributor, the Rundle-Spence Company, gave us immediate service. But our National Tube Distributor is always ready for critical situations. He keeps two trucks on a stand-by basis, and there's a four-man crew on 15-minute call seven days a week.

"Rundle-Spence offers expert engineering and technical advice, constantly feeds us new product information, and is a single, complete source of steel tubular products. We also know that our National Tube Distributor has a wide range of available pipe sizes—⅛-inch to 24-inches. We've standardized on National Tube products for all piping installations, because they're the finest tubular products in the world."

Why don't you combine the fast, dependable service and technical assistance of a National Tube Distributor with USS National Steel Pipe? The next time you need top-quality steel pipe for plumbing, heating, power or air-conditioning applications, see your local National Tube Distributor.

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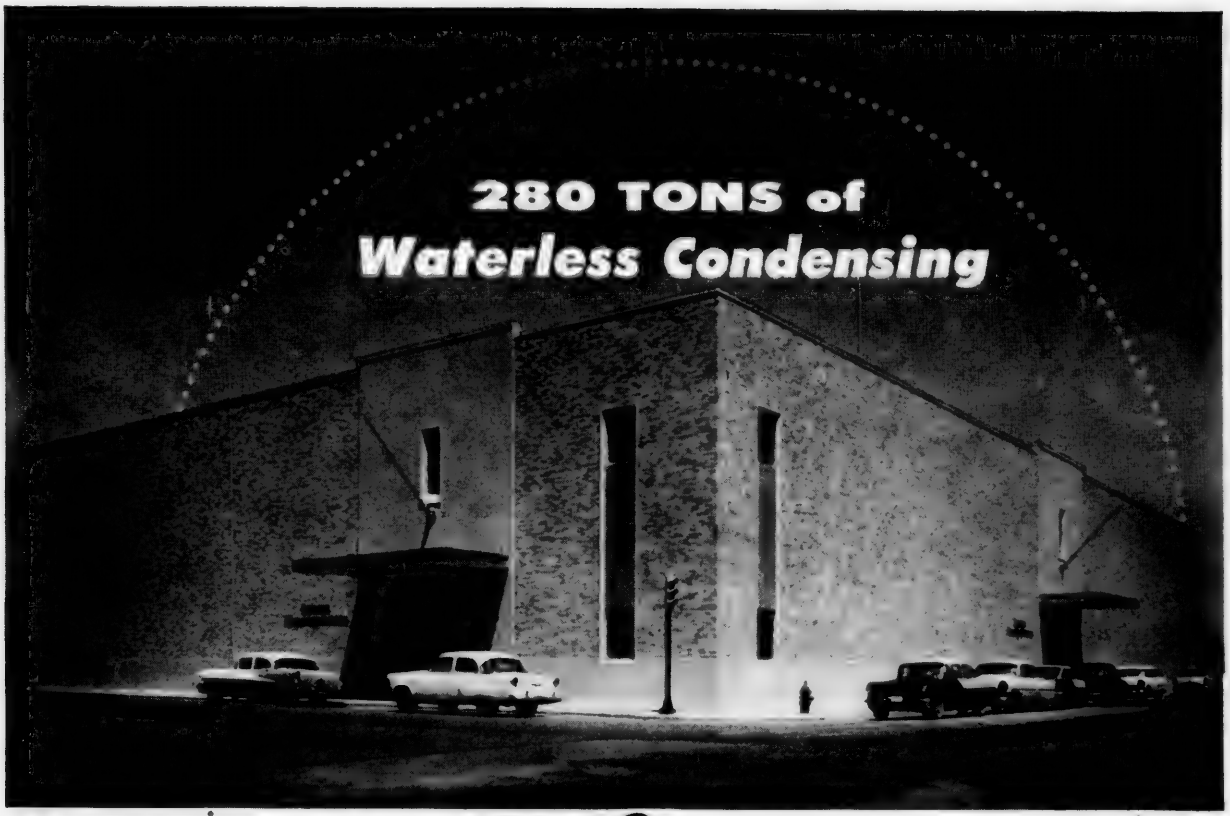


The Avalanche Journal Building, Lubbock, Texas. W. A. McMillan, Architects; Hedrick and Stanley, Engineers; Anthony Co., Mechanical Contractors.

with McQuay AIRCONS for this Texas Newspaper Plant

Remote McQuay horizontal air flow Aircon installation with wind deflectors at Avalanche Journal Building, Lubbock, Texas.

IN LUBBOCK, TEXAS, where the weather is both hot and dry, and water is a problem, this bank of 10 McQuay Aircons furnishes 280 tons of refrigerant condensing for the new plant of the Avalanche Journal.

Engineers and architects like McQuay Aircons because of their flexibility and their operating and installation economy. McQuay Aircons are made in 8 models from 7½ to 75 tons capacity in a single unit in either vertical or horizontal air flow models. Unlimited capacity is available in multiple unit installations.

You not only get more models and more capacity, you get more performance, because McQuay Aircons have the exclusive McQuay Ripple-Fin coils—the finest and the standard of the industry.

The McQuay "Seasontrols", automatic head pressure controls, are available as accessories, and modulate the condenser capacity in accordance with the weather for proper operation at all times. For complete information, call the McQuay representative in or near your city, or write McQuay, Inc., 1619 Broadway Street N.E., Minneapolis 13, Minnesota.

McQuay INC.

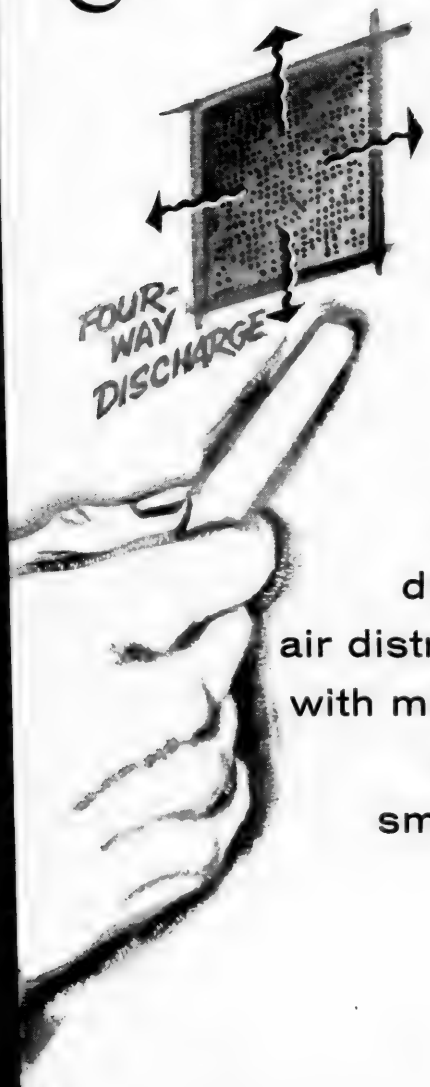
AIR CONDITIONING • HEATING • REFRIGERATION

[redacted] Means Quality

The air

ONE-WAY DISCHARGE
TWO-WAY OPPOSITE DISCHARGE
THREE-WAY DISCHARGE
Recessed type
Surface type
Air pattern control plates can be installed on the job or at the factory.
Diffuser plate removable to provide vertical discharge.

goes where you want it

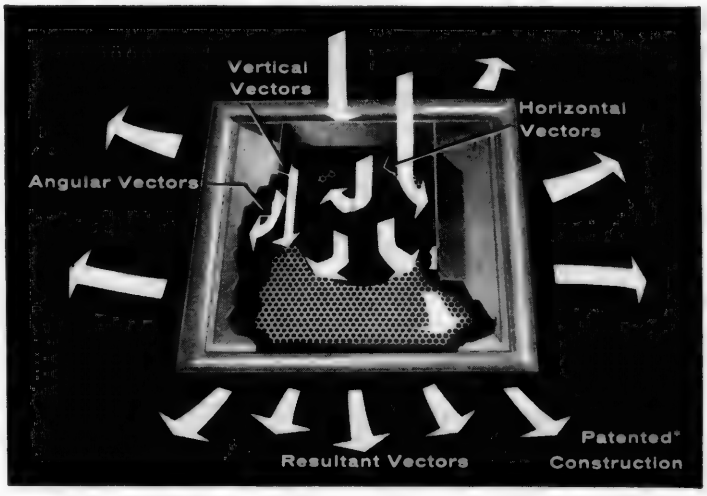


. . . with the original square perforated face diffuser

Uni-Flo square and rectangular ceiling diffusers with perforated faceplates provide a high rate of aspiration and great flexibility to meet the requirements of modular construction or any arrangement of partitions.

The air pattern can be adjusted on the job for vertical or horizontal deflection, and for one-, two-, three-way, or 360° discharge without altering the appearance.

Quiet, draftless air distribution with minimum ceiling smudging



These attractive units are inconspicuous and blend well with all types of ceiling construction; the engineered air flow minimizes ceiling smudging.

Patented* design assures low pressure drop for draft-free comfort at very low noise levels. Imitated by many but unequaled in performance. Available in recessed or surface-type units for all types of acoustical, plastered, or metal pan ceiling applications. Complete performance data available . . . guarantees job performance.

For complete information, call your local Barber-Colman Air Distribution field office or write for Catalog No. F-6597-2.

Also available with factory-built hinged assembly for control of room coverage.

BARBER COLMAN

*Patent No. 2821891

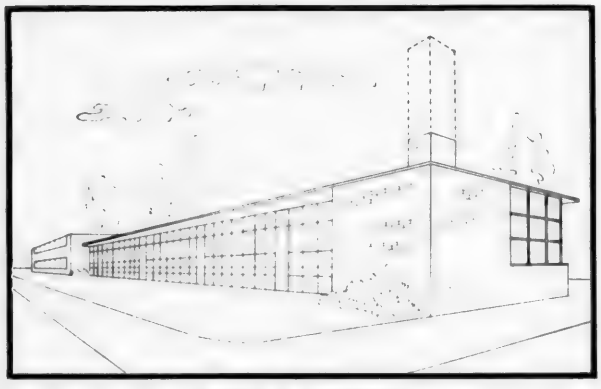
BARBER-COLMAN COMPANY

Dept. F, 1102 Rock Street, Rockford, Illinois

SAVES IN THREE IMPORTANT WAYS

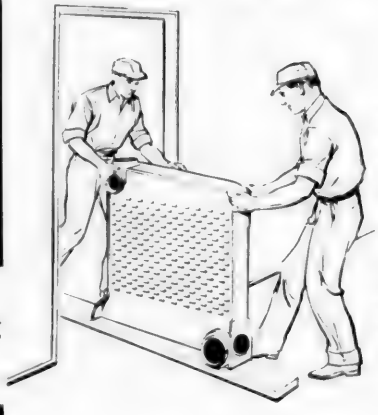
The Weil-McLain Type "J" Gas Boiler invites your critical comparison...for outstandingly efficient design, space conservation, easy installation, low maintenance and long life. A few of its many features include:

1. Made of corrosion-resistant cast iron—with finned sections—internal steam separators—large flow tappings.
2. A.G.A. approved efficiency of 80%...approved for all gases.
3. Develops full capacity as rated by A.G.A. and I-B-R.
4. Available with A.G.A. approved dual fuel manifold.
5. Electronic controls and pre-wired control panels engineered as part of unit.
6. No refractories, no motors or fans, no tube replacement, no water treatment.
7. Wide range of sizes permits close sizing to load.



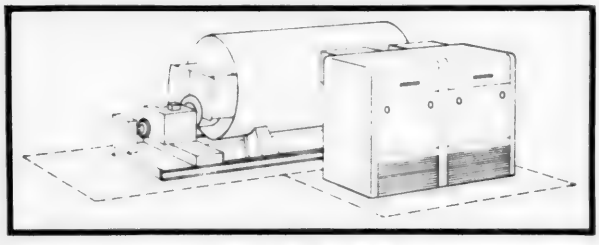
SAVES A CHIMNEY

A high chimney, forced draft or induced draft are not necessary for the proper operation of the "J" Boiler. All "J" Boilers can operate with a vent.



SAVES TIME AND LABOR

Sectional design of "J" Boiler is more flexible. For either new or replacement work, the boiler can be moved in through an ordinary door, section by section, at any time during construction. Assembly with short draw rods simplifies erection...saves labor...assures freedom from stresses and strains.



SAVES SPACE

Sketch shows the space saved by a 60 H.P. Type "J" Boiler over a typical scotch marine boiler of comparable rating. It is approximately one half as long, one foot less in height and only a few inches greater in depth, including space necessary for the draft hood. The required service area is smaller...and appreciably smaller if tube replacement is to be made through the rear door of the scotch marine boiler.

WEIL-McLAIN

TYPE "J" CAST IRON GAS BOILERS

Net I-B-R Capacities:
360,100—3,354,000 BTU per hr.

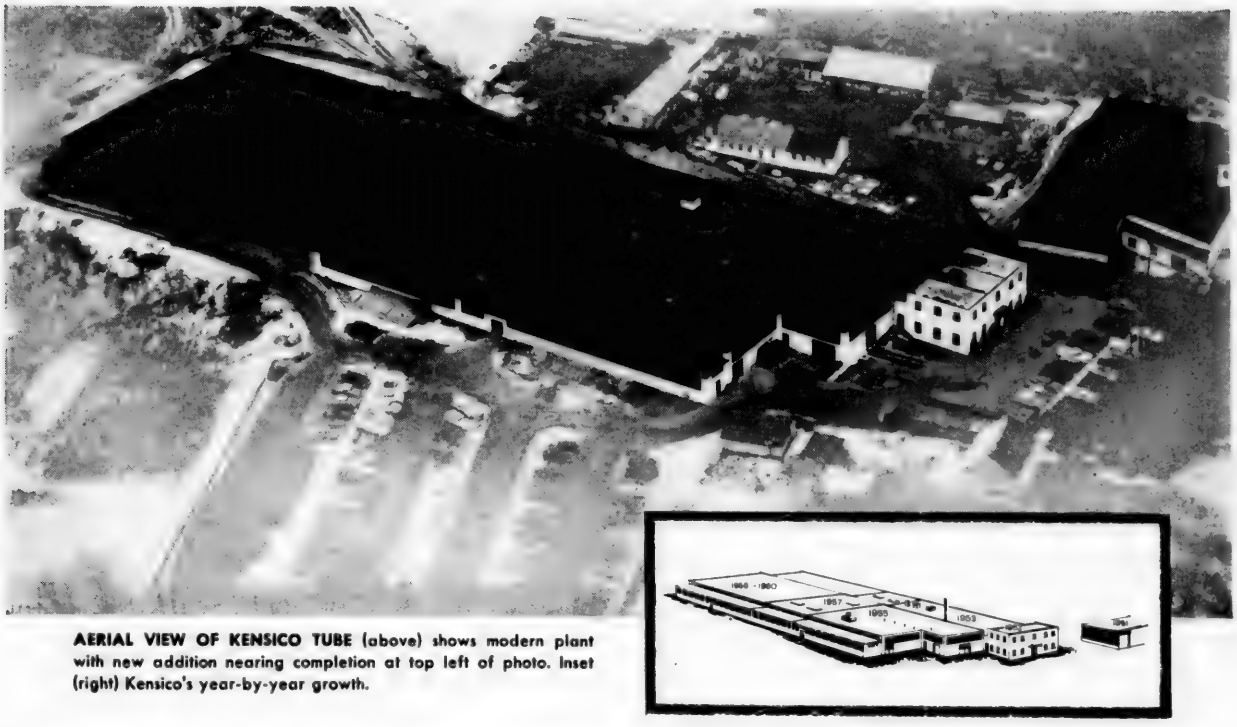
Send for Bulletin C-297.

WEIL-McLAIN BOILERS · RADIATORS

WEIL-McLAIN COMPANY
MICHIGAN CITY, INDIANA

Address literature requests to Dept. BB-60

SET FOR THE SOARING SIXTIES



AERIAL VIEW OF KENSICO TUBE (above) shows modern plant with new addition nearing completion at top left of photo. Inset (right) Kensico's year-by-year growth.

PACE-SETTER during a period of phenomenal growth in northern Westchester County, N. Y. Kensico Tube is Mt. Kisco's largest manufacturing business. Products include: hard and soft copper water tube; copper air conditioning, refrigeration and instrumentation tube; and copper tubing for propane gas lines, heat exchangers, automotive and industrial applications. Now, after more than a decade of corporate growth and expansion of production and marketing facilities, Kensico is set to meet the challenge of the SOARING SIXTIES.

IN 1950, CONSTRUCTION of first new building was started. Kensico had been chartered under N. Y. State Law in 1945. Under present management since 1948. Until 1951, company was located in an old cider mill which it leased (floor space 8500 sq. ft.).

TODAY, AFTER PUTTING UP 4 MORE ADDITIONS, Kensico has more than 60,000 square feet of modern fireproof plant and office space.

BY SPRING, 1960, Kensico expects to complete a new 40,000 square foot addition to the plant. Total plant and office space will then exceed 100,000 square feet.

PRODUCTION HAS INCREASED with each addition since 1950. It will be still further increased in both capacity and range of sizes by the new 1960 addition.

IN THE TEN YEAR PERIOD, 1950-1960, Kensico has had a 7-fold growth in gross sales.

EFFECTIVE FEBRUARY 1st 1960, Kensico Tube Company Incorporated, Mt. Kisco, N. Y., merged with Robinson Technical Products, Inc., Teterboro, N. J. Robinson also has other corporate facilities at Hingham, Mass., and Santa Monica, California. The merger strengthens Kensico's position in engineering and metallurgy and places new technological know-how and experience at the disposal of Kensico's customers. Kensico's new name is KENSICO TUBE COMPANY DIVISION — ROBINSON TECHNICAL PRODUCTS, INC.

Kensico Tube
COMPANY DIVISION
Robinson Technical Products, Inc.

MOUNT KISCO, NEW YORK

Kensico Products are also Available Through Warehouse Distributors and Sales Representatives in Cambridge, Mass.; Middlebury, Conn.; Buffalo, N. Y.; Lindenhurst, N. Y.; Goshen, N. Y.; Roselle, N. J.; Philadelphia, Pa.; Flourtown, Pa.; Pittsburgh, Pa.; Cleveland, Ohio; Detroit, Mich.; Evanston, Ill.; St. Louis, Mo.; Milwaukee, Wisc.; Durham, N. C.; Berwyn, Ill.; Ft. Lauderdale, Fla.; St. Petersburg, Fla.

In the Chicago area you'll find hundreds of Arkla-Servel Sun Valley Gas air conditioners in food stores, drug stores, general stores, restaurants, taverns, halls, beauty parlors, medical centers, business offices, service offices, plant offices, small factories, small shops, repair shops, barber shops, branch offices... bringing year 'round comfort to customers and employees.

more and more Chicago businesses are cooling with GAS! Many Chicago firms need a compact, automatic unit that will both heat and cool at low cost. That's why – in a one year period – 275 Arkla-Servel Sun Valley Gas air conditioning units were specified and are being used in business places throughout the Chicago area.

With this central Gas unit, there's no need for fans, window air conditioners or separate cooling units. The design is so clean and simple that it can be installed wherever there is room... out in the open, on the roof, in the basement, or in the back room.

In addition to heating and cooling, the Arkla-Servel Sun Valley unit also cleans the air, dehumidifies and ventilates to assure year 'round comfort.

The Arkla-Servel Gas air conditioner is flexible, too – comes in 3½ and 5-ton units which can operate singly or be adapted to multiple installations depending upon the amount of space to be air conditioned.

If your customers and employees sweltered this summer, think now about installing a Gas cooling system before next year's heat wave is here. For specific information, call your local Gas company or write to the Arkla Air Conditioning Corporation, General Sales Office, 812 Main St., Little Rock, Ark. AMERICAN GAS ASSOCIATION

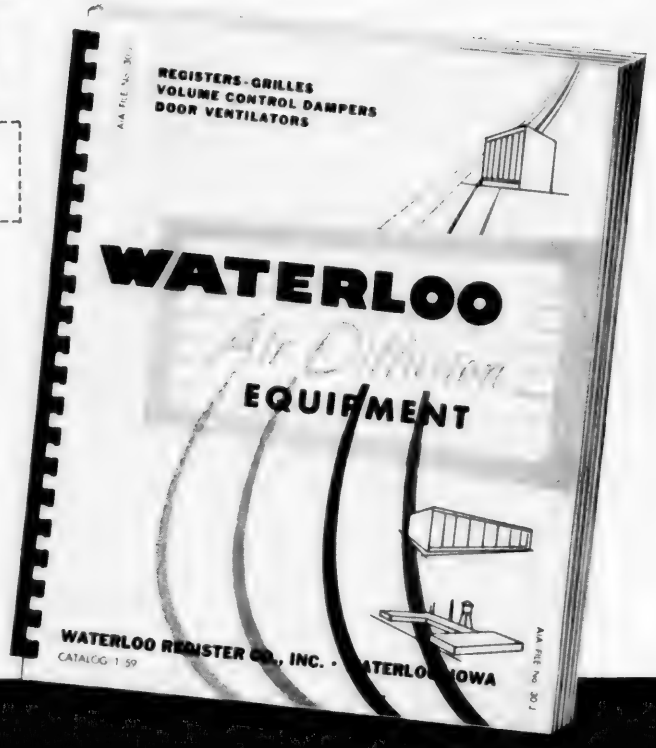
FOR HEATING & COOLING GAS IS GOOD BUSINESS

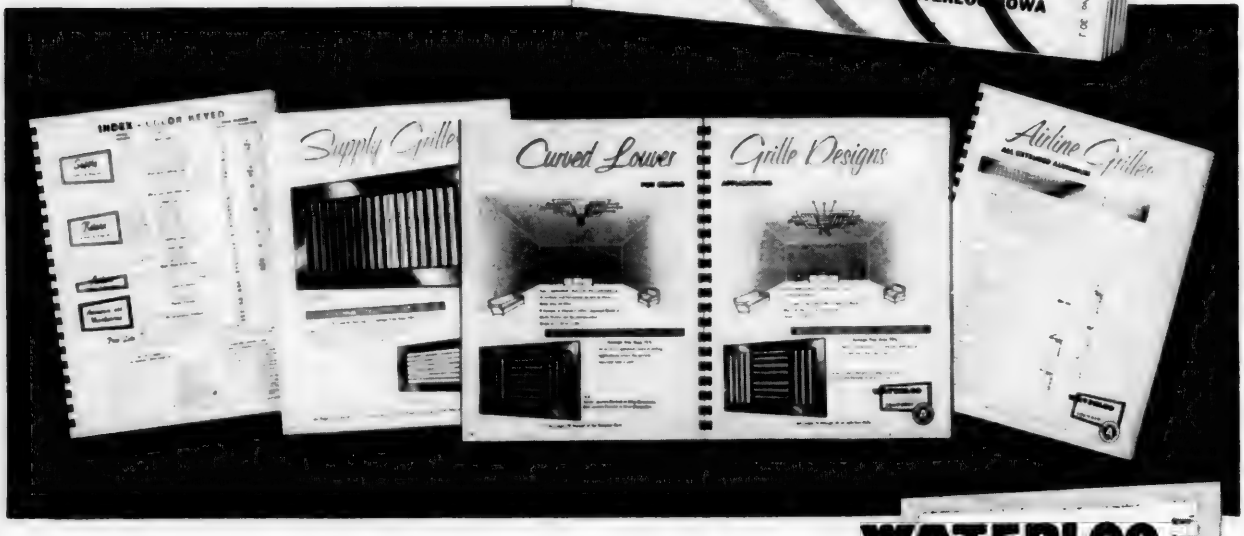
The Producers' Council of
THE AMERICAN INSTITUTE OF ARCHITECTS
*awards** Certificate of Merit *to*

WATERLOO CATALOG

*Presented at the A.I.A. Convention in San Francisco on April 18, 1960

The Producers' Council, Inc. of Washington, D.C. has awarded a Certificate of Merit in the 1960 Building Products Literature Competition to a comprehensive air diffusion equipment catalog published by Waterloo Register Co., Inc. The Award was made for "an outstanding effort in the production of informative, high quality product literature."



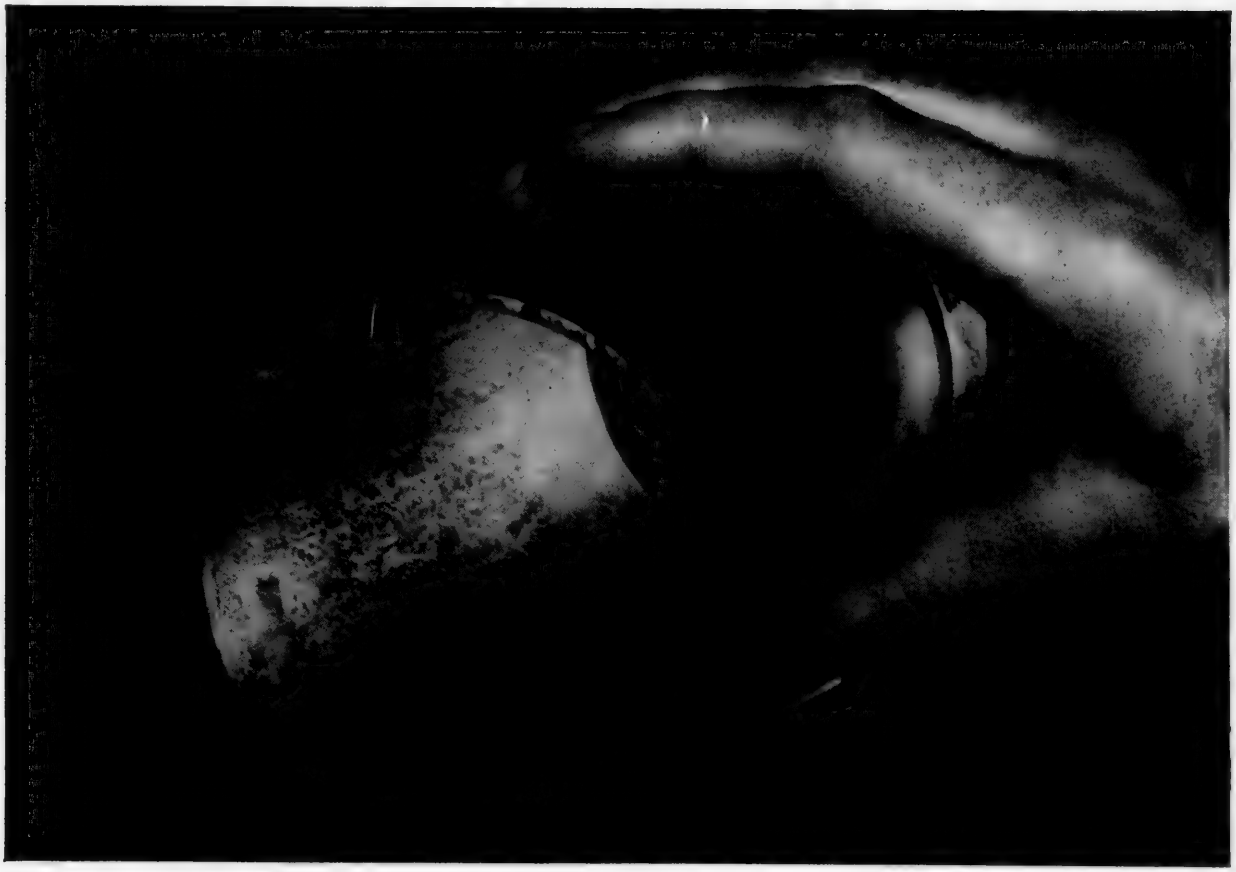


Write for your free copy of this comprehensive guide to the quality-built Waterloo line.

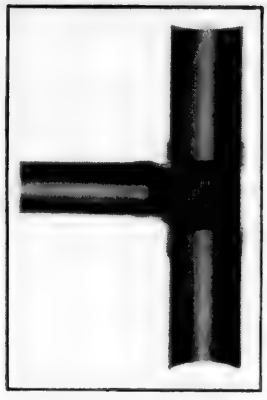
WATERLOO REGISTER COMPANY, INC.
P.O. BOX 72, WATERLOO, IOWA

WATERLOO Air Diffusion EQUIPMENT

WR128



Unretouched photo of 3" dia. copper tube removed after 13 years' service in a soil line.



Anaconda drainage fittings are designed to match Anaconda tube for fast, easy solder connections.

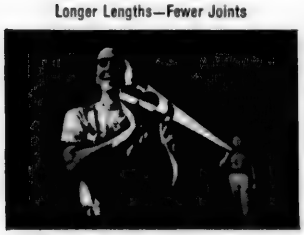
WASTES FLOW FREELY IN COPPER DRAINAGE SYSTEMS AND YOU SAVE MONEY. Compare the condition on the inside of this copper tube with what you might expect to find in ordinary piping after 13 years in service. Rust-caused troubles such as reduced flow or stoppages do not occur inside copper drainage lines. That is why many plumbing codes allow the use of 3" diameter copper tube for soil line and vent. Material costs are reduced and, because a 3" copper tube stack with fittings fits inside a standard 4" partition, the need for expensive, space-consuming plumbing walls is eliminated. Save time, effort, and money—install the modern drainage system with Anaconda copper tube and fittings. For information, write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

6001

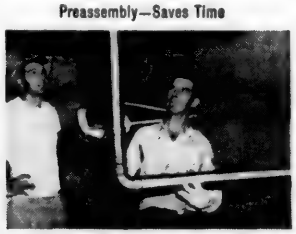
ANACONDA® **COPPER TUBE AND FITTINGS for soil, waste and vent lines**

Available through plumbing wholesalers. Products of The American Brass Company

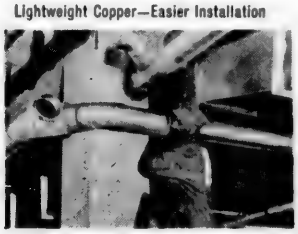
Longer Lengths—Fewer Joints



Preassembly—Saves Time

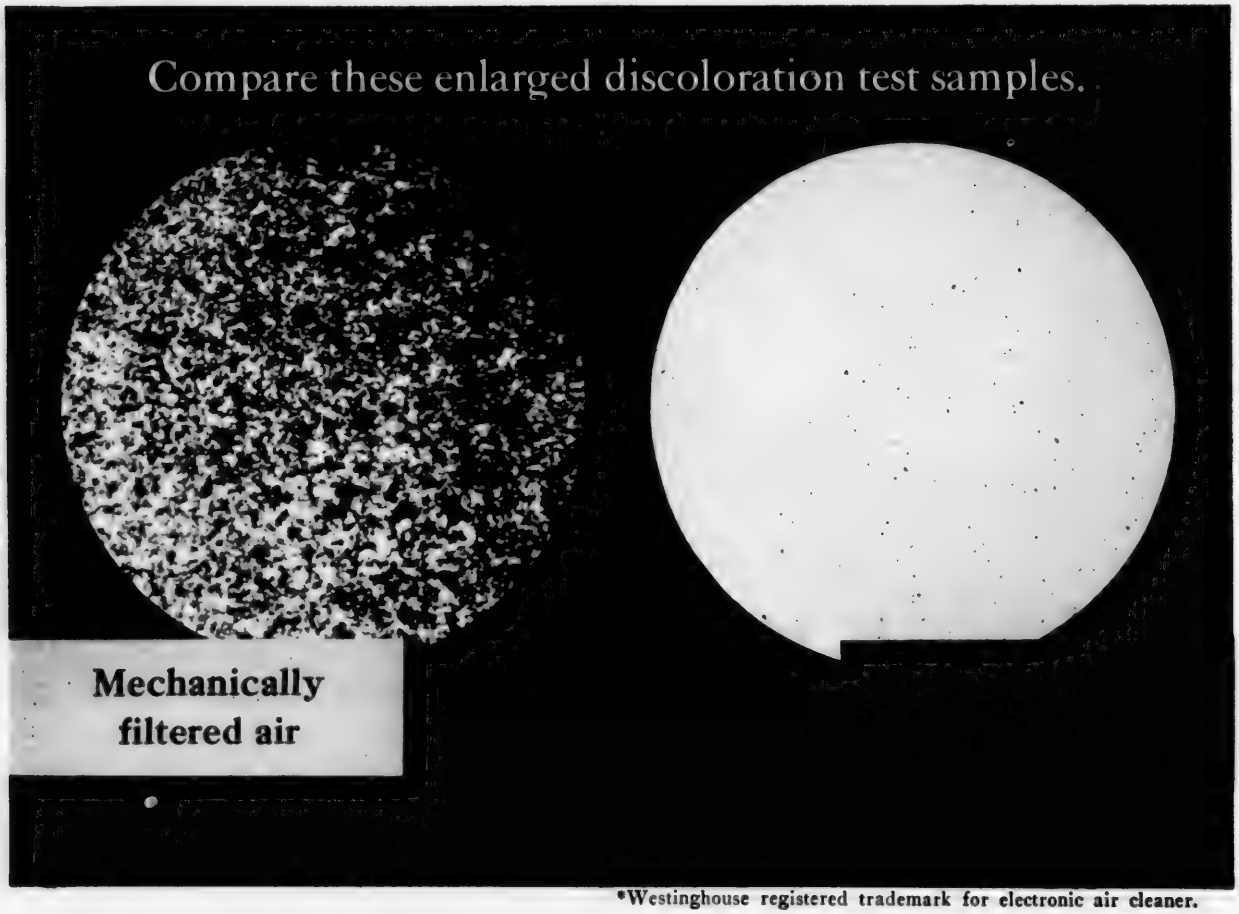


Lightweight Copper—Easier Installation



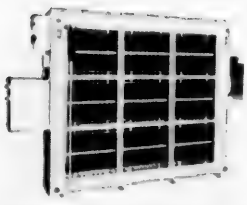
Compact Connections—Save Space

CLEAN AIR ELECTRONICALLY TO MAKE YOUR FILTERING INVESTMENT PAY OFF



*Westinghouse registered trademark for electronic air cleaner.

Westinghouse PRECIPITRON traps air-borne dirt that filters cannot catch



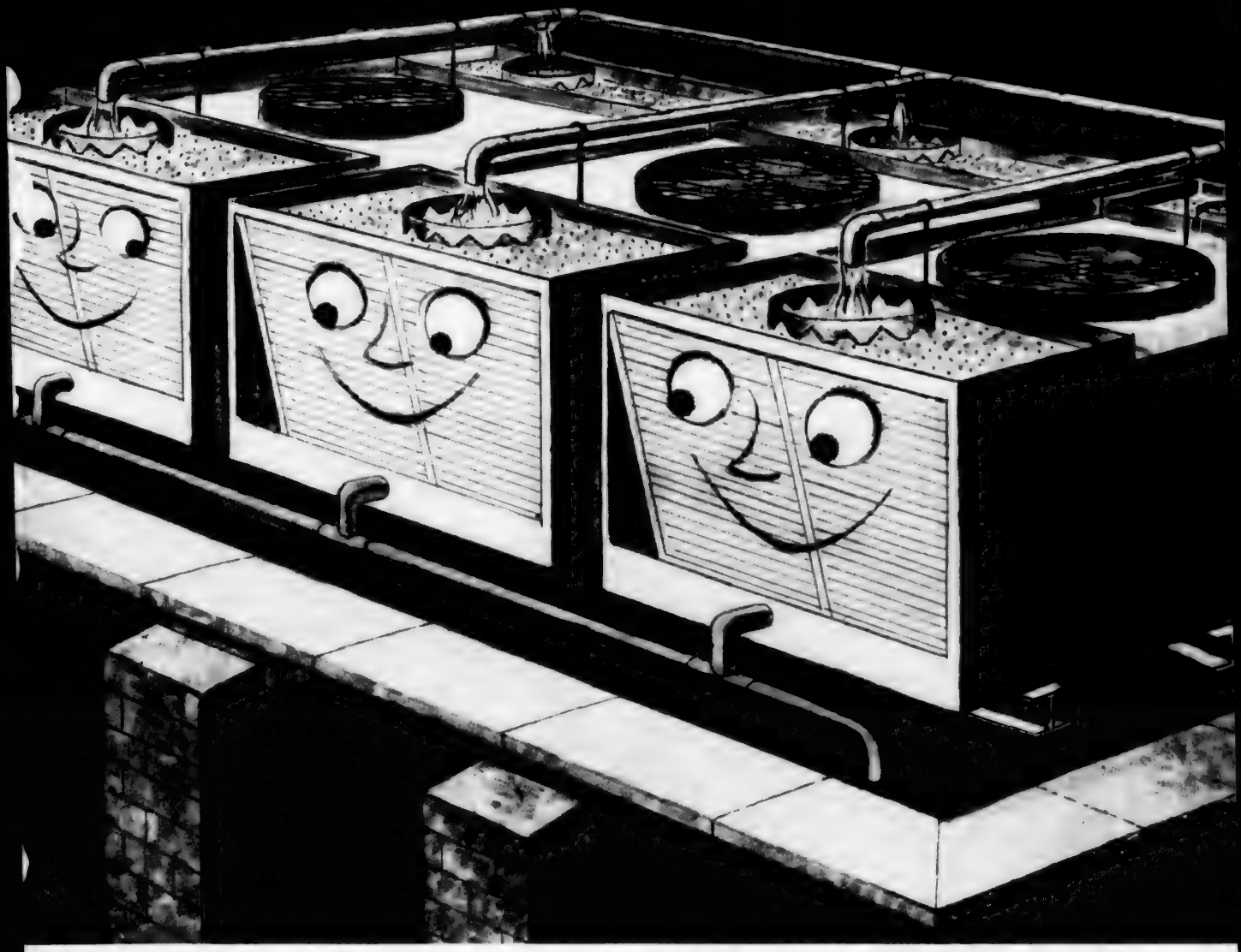
Why do electronic air cleaners outperform conventional filters? By electrostatic ionization and trapping of dirt particles, the Precipitron air cleaner can remove up to 95% of atmospheric dirt. Mechanical filters rarely catch more than 15%. These figures have been confirmed by the National Bureau of Standards Dust Spot Test Method.

Whether you must clean air for an industrial process, maintain merchandise quality, or minimize maintenance cleaning costs, Precipitron air cleaning installed in place of filters, will evaluate to your advantage in lower total cost.

For factual cost comparison data call your Sturtevant Division Sales Engineer for Bulletin B-5201, or write Westinghouse Electric Corporation, Dept. FV99, Hyde Park, Boston 36, Mass. *Sturtevant... pioneers and pacesetters in air treatment for 100 years... 1860-1960.*

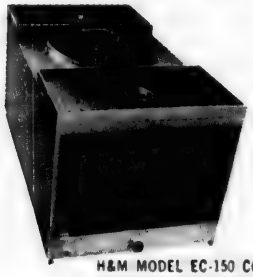
YOU CAN BE SURE ...IF IT'S Westinghouse

J-80699



How to cut costs on a 450-ton cooling job:

Use three Halstead & Mitchell 150-ton cooling towers!



H&M MODEL EC-150 COOLING TOWER
WITH 10-GAUGE STEEL CABINET

How can three units be cheaper than one? Simple. Halstead & Mitchell packaged cooling towers come to you completely assembled and therefore less expensive to install. They operate at lower cost because there can be no wasted capacity; with step-control, you get capacity as you need it.

Furthermore, with "modular" units, you can place each tower near the equipment it's to be used with. This gives you closer control of water temperatures—another economy factor. Then, too, if one tower must be shut down, you can continue to operate the others.

The advantages go on and on: lower silhouette, lower rigging costs, and utmost flexibility—towers can be easily moved or supplemented as requirements change. And, like all H&M towers, these carry the exclusive 20-Year Guarantee on the wetted deck against failure due to fungus attack or rotting.

Contact your Halstead & Mitchell distributor for complete information on H&M cooling towers in 3- to 150-ton capacities. Or write Halstead & Mitchell Co., Bessemer Bldg., Pittsburgh 22, Pa.

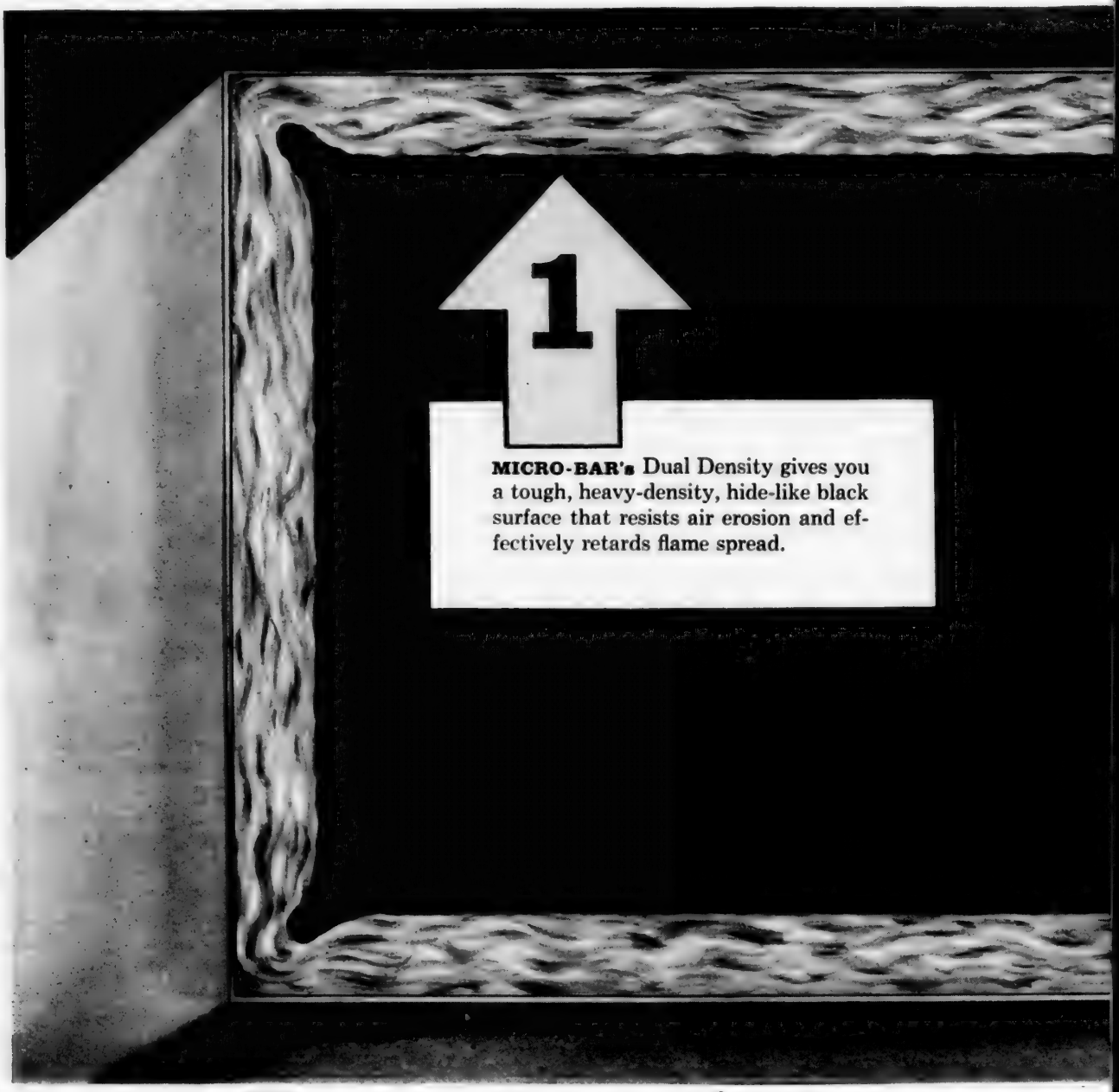
HM

Halstead & Mitchell

Cooling Towers • Water-Cooled Condensers • Air-Cooled Condensers • Finned Coil Products • Air-Handlers

"DUAL DENSITY"...

announcing an entirely new concept in fire-resistant and sound absorbent Fiber Glass duct liner from Johns-Manville


1
MICRO-BAR's Dual Density gives you a tough, heavy-density, hide-like black surface that resists air erosion and effectively retards flame spread.

J-M's NEW

MICRO-BAR

GIVES YOU THESE IMPORTANT ADVANTAGES:

- *Extremely Low Fire Hazard Rating*
- *Tough Surface That Resists Air Erosion*
- *Exceptional Acoustical Performance*
- *Eliminates Need For Metal Nosings*
- *Greater Holding Power For Pins*
- *Easy To Apply By Conventional Methods*

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INSPECTED
BATTS AND BLANKETS
Not Over 500 Sq. Ft. Issue No. F 141
FIRE HAZARD CLASSIFICATION (Based on 100 for untreated Red Oak)
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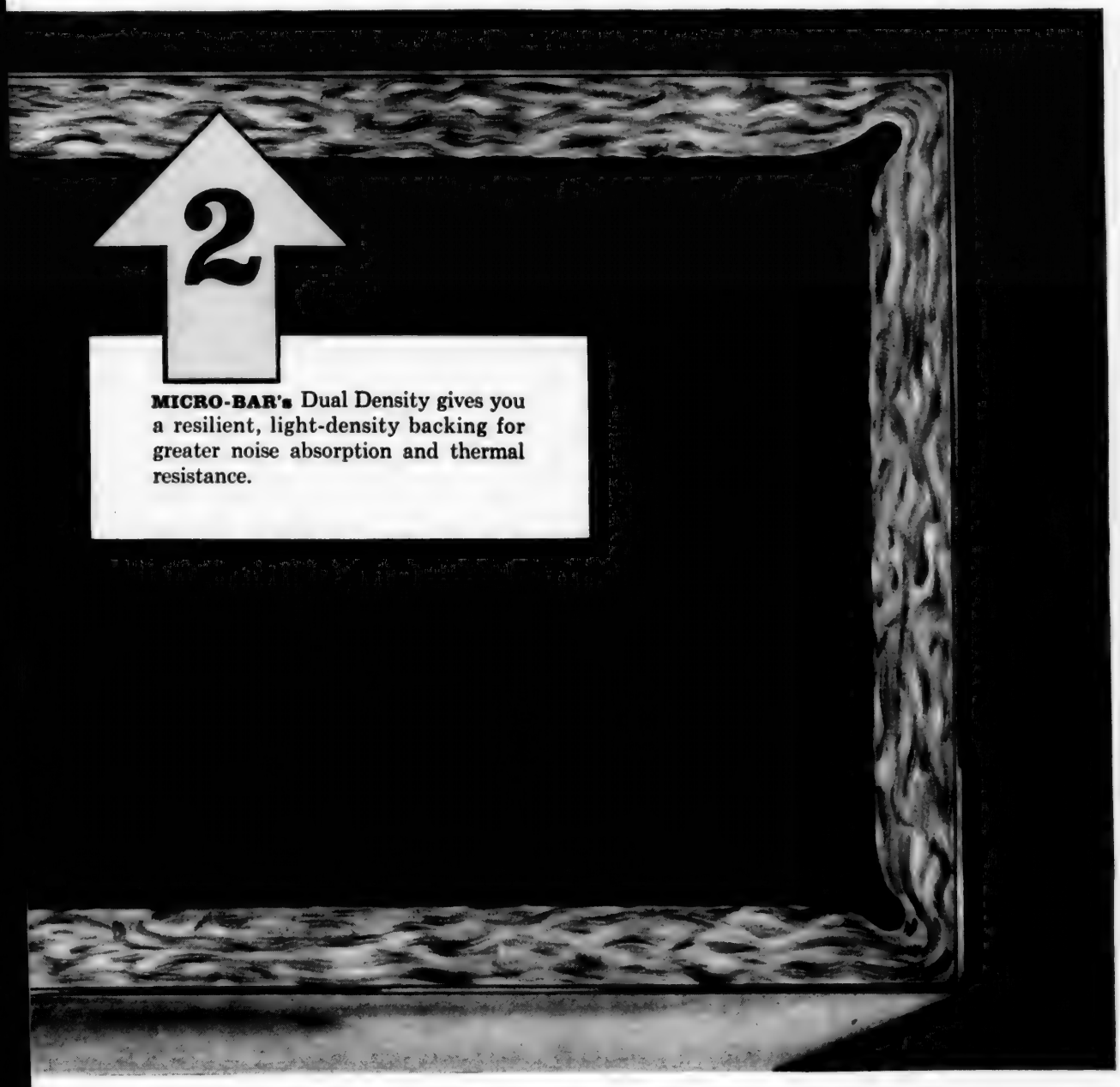

MICRO-BAR's Dual Density gives you a resilient, light-density backing for greater noise absorption and thermal resistance.

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS

It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

COMPARATIVE COST OF HIGH VELOCITY DUAL DUCT SYSTEMS

N. S SHATALOFF
Consultant, Buensod-Stacey Corp.,
New York, N. Y.

◄ High velocity dual duct system was installed in The Field Building, Chicago, Ill.; The Field Foundation, Inc., owners; Naess and Murphy, engineer and architect.

There are many factors that influence the owning and installed costs of air conditioning systems. In general terms, here is a discussion of the economic aspect of some such practices as related to high velocity dual duct systems.

PROBABLY one of the most unusual aspects of high velocity dual duct systems is the impossibility of putting a price tag on the system, due to the exceptionally wide range in installed costs. Records based on hundreds of installations reveal that the total installed costs of most systems fall in range of $3 to $5.50 per square foot of floor area. There is also a small number of installations with installed costs lower or higher than the above average range. If the systems are analyzed on the basis of owning costs, the cost range will be even greater.

The owning and installed cost of any air conditioning system is affected by many factors such as: Design objectives, structural and architectural features of the building, quality of material and workmanship and degree of cooperation between engineers and architect. When dealing with high velocity dual duct systems, in addition to these factors, the cost of the system is affected to a large degree by the current design and application practices.

Volumetric Control

At present time there are two recognized methods of control of volumetric delivery from dual duct systems:

1. *Indirect Method.* Where pressures in the ductwork are regulated by static pressure controllers, in order to minimize the volumetric changes at individual outlets.
2. *Direct Method.* Where volumetric delivery is controlled at each terminal point by devices commonly known as "constant volume boxes."

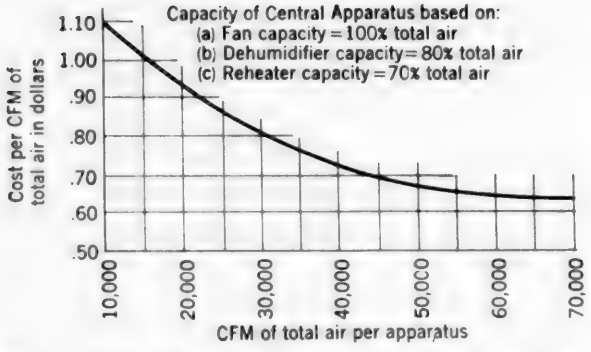

Fig. 1. Cost of central apparatus. Cost of central apparatus includes:

1. Class II supply fan
2. Class I return air fan
3. Fan motors
4. Motor starters
5. Variable pitch drive
6. Vibration absorbing bases
7. High pressure dehumidifier
8. 8-row cooling coil
9. 2-row cooling coil
10. 1-row preheat coil
11. Spray pumps and piping
12. Apparatus casing
13. Simple filters
14. Automatic control
15. Specialties, doors, etc.

The relative merits of these two types of controls on performance of the system were discussed at length in various technical publications, and better performance of the system equipped with constant volume units is now recognized by the industry. However, it is not generally realized that introduction of constant volume units was dictated not only by performance of the system, but equally by economic considerations.

The cost analysis of numerous high velocity dual duct installations reveals that the increment cost of provisions for control of constant air volume is a relatively small figure. If the air volume is controlled at each terminal point as it is done with constant volume boxes, the increment first cost of this type of control ranges between 4 to 6 cents per square foot of conditioned area. These figures are applicable to layouts where average zone, as determined by a mixing unit, is handling approximately 600 to 800 cfm.

If provisions for volumetric control consist of static pressure controllers regulating pressures in the duct mains, the increment first cost is usually 2 to 4 cents per square foot of floor area. However, it should be pointed out that if static pressure controllers are applied to a relatively complicated layout, and are installed in each branch duct leaving the riser, then the cost of such provisions for volumetric control will be higher than that required with constant volume boxes.

If we keep in mind that the installed costs of high velocity dual duct systems is approximately $3 to $5.50 per square foot of floor area, it becomes obvious that the differences in increment direct costs between these two types of volume control represents an insignificant part of total installed cost of the system. On the other hand, the systems equipped with constant volume units will permit a different approach to basic design of the system and in this manner will greatly affect the installed and owning costs of the installation.

For example, whenever the air volume is closely controlled at the terminal points, a lower design cold duct temperature could be used without danger of creating drafts. This will allow the reduction in size of the air handling plant and fan horsepower. Thus a reduction of only 5 deg F in cold air supply temperature and in corresponding decrease in size of the air handling system may represent savings in installed cost of the system as much as 25 to 40 cents per square foot of conditioned area, after making proper allowances for slight increase in cost of refrigeration due to lower supply temperature.

If the volume regulators are used at each mixing unit, it becomes unnecessary to break up the air handling system into a number of smaller, simpler plants just for the sake of being able to obtain an appropriate spot in the duct system for pressure sensing devices. Thus, by combining only two systems into one, the designer may save 10 to 20 cents per square foot of conditioned floor area on installed cost of apparatus. Combining three systems into one may save 20 to 30 cents per square foot. In addition, the larger air handling plants will require less floor area per cfm of the air handled and in this manner will further decrease the owning cost of the system. The savings in installed cost of central apparatus as a function of capacity of the plant, could be illustrated by the cost curve shown in Fig. 1.

The larger air handling system which becomes feasible with constant volume mixing units, also will allow one to design more economical air distributing systems and may represent, at times, savings as much as 40 to 60 cents per square foot of floor area. The usual range of installed costs of high velocity dual duct air distributing systems is shown in Fig. 2. The distributing system cost constitutes a relatively large percentage of the total installed cost of the system, if the system is designed so that the pounds of sheet metal per cfm of the air handled is high, and the system is complex. Consequently, one of the main functions of the design engineer is to simplify the general arrangement of the air handling system and to reduce the weight of iron per cfm of the air handled. That, in general, becomes possible by handling air in relatively large ducts with relatively large systems.

There are many other economical advantages associated with constant volume controls at the terminal

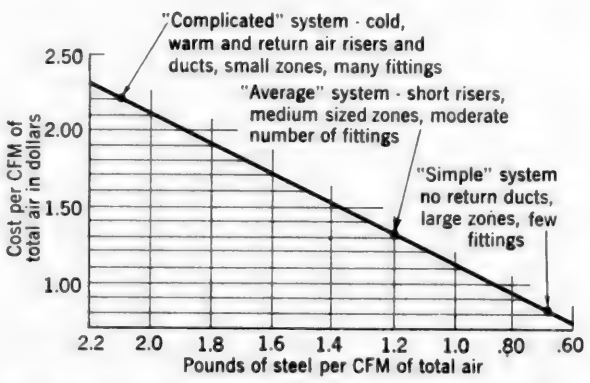

Fig. 2. Cost of general distributing duct system. This cost includes:

1. Sheet metal mains and risers
2. Insulation of cold air ducts and risers
3. Metal and lining of low pressure duct work
4. Air outlets and grilles
5. Miscellaneous vanes, caulking compounds, fire dampers, etc.

points which will tend to decrease the owning cost of the installation.

1. Reduced danger of obsolescence of the system. Unavoidable future changes and migration of internal loads can be taken care of by pressurizing the air handling system and by addition of new mixing units. There are numerous cases where dual duct systems were designed and put in operation with pressures only 2 to 2.5 inches w.g. After several years of operation, the systems were extended and pressures had to be increased to 4 to 5 inches w.g. Since original systems were equipped with constant volume mixing units, no changes in original air handling systems were required.
2. If constant volume units are used, the system can be put in operation prior to its completion. This feature is of special importance on large existing buildings where air conditioning installation has to be spread over a long period. On one large installation, the owner was able to accelerate the application of new rental rates on the partially completed system and to obtain in this way an additional revenue equivalent to over 50 cents per square foot of rentable area for one year.
3. If the units are pre-set for the required air volume in the factory, the balancing and adjusting of the system in conventional sense is almost entirely eliminated. In addition, this will assure the engineer and the owner of compliance of the system with the design requirements.
4. Volumetric changes on individual units due to future changes and shifting of internal loads can be done easily by the owner without affecting control and air flow through the adjacent units.
5. The design of the system equipped with constant volume units is greatly simplified. Since system characteristic will remain stable at all times, the design of the air handling system can be reduced to rational terms without introduction of often misleading probability factors. The volume controllers in the units will compensate for pressure unbalance in the system due to initial design, future load changes, or normal operational pressure changes in the system.

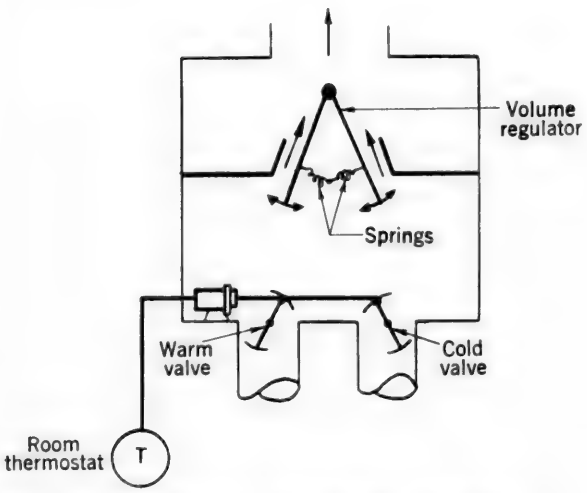

Fig. 3. Type-A dual duct constant volume unit.

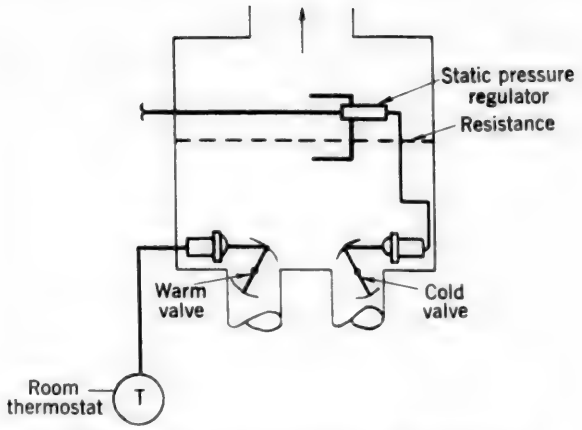

Fig. 4. Type-B dual duct constant volume unit.

These examples serve to indicate the general areas in which savings in owning cost of the system can be achieved whenever volumetric delivery of the system and individual outlets is controlled at terminal points.

Constant Volume Dual Duct Mixing Units

At present time there are nearly ten manufacturers of dual duct air mixing units that offer equipment with automatic control of delivered volume. Arrangement of the mechanical components vary greatly among the manufacturers but the basic method of automatic control of volume and temperature falls into only two categories. These two methods are shown in Figs. 3 and 4. For this discussion they will be referred to as Control Method *A* and *B*, respectively.

Method A

Method A is a direct control of both temperature and volume. A thermostat controls the mixture of cold and warm air and a self-contained spring balanced volume regulator controls the volume at the discharge of the 3-way air mixing valve. With this arrangement, as long as there is sufficient air pressure at both warm and cold inlets of the mixing valve to overcome the resistance interposed by the mixing unit, the volume will remain constant and the thermal quality of the air delivered will be responsive to the requirement of the thermostat.

If the pressure at either inlet of the valve should fall below the point necessary to overcome unit resistance, the thermostat will throttle or close off the other inlet; the volume delivered by the unit may fall below the specified quantity but the temperature of the reduced quantity will not be affected. This is especially important under special design and operating conditions during the heating season and these will now be discussed and listed.

Method B

Method *B* is indirect in control of both temperature and volume. Method *B* may be actuated by compressed

TABLE 1—FLOOR AREA REQUIRED BY DUAL DUCT AIR HANDLING PLANT

Net Area of Building Served By Plant Sq Ft	Total Area Required By Plant, Sq Ft	Clear Head Room, Ft	Preferable Shape of Plant Room, Ft		Per Cent of Net Area Served By Plant
			Depth of Room	Width of Room	
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6
	460	8	26	18	2.3
20,000	440	10	26	17	2.2
	420	12	28	16	2.1
	1,100	8	30	37	2.2
50,000	1,000	10	30	33	2.0
	950	12	30	32	1.9
	850	14	30	27	1.7
	2,100	8	32	66	2.1
100,000	1,900	10	32	60	1.9
	1,700	12	32	53	1.7
	1,500	14	32	47	1.5
	2,700	10	34	80	1.8
150,000	2,400	12	34	70	1.6
	2,100	14	34	62	1.4

Notes: 1. Net usable area assumed to be 80% of gross area of building.
2. Areas required for refrigeration plant or miscellaneous exhaust systems not included.
3. Total C.F.M. handled assumed to be 1.2 per square feet of net area.

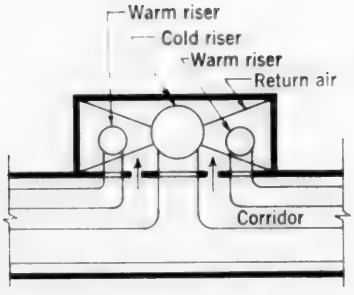

Fig. 5. Risers and returns in a typical shaft.

air or by the air pressure of the system. The results are the same. A space thermostat controls only the warm air inlet, and a static pressure regulator controls the flow through the cold air inlet. The pressure drop across a resistance plate is kept constant to give fixed outlet volume. As the thermostat throttles the warm air, the static pressure regulator opens the cold air inlet to give constant volume. If the warm air pressure is insufficient to overcome the resistance of the mixing unit, the thermostat will open the warm air inlet wide when calling for heat, but low pressure will prevent full flow of the warm air and the static pressure regulator will therefore open the cold air inlet until the volume control is satisfied. Thus, insufficient pressure in the warm air duct can produce cooling of the conditioned space on the down-stream end when the room thermostat is calling for heat.

Several normal design and operating conditions can produce excessively low pressures in the down-stream side of the warm duct:

1. In starting up after shutdown in cold weather, if the warm ducts are substantially smaller than the cold ducts.
2. When supply fans are run at low speed as for night heating.
3. When one of two supply fans feeding the same duct system is non-operative as during night heating, breakdown or inspection shutdown.
4. When the warm duct temperature falls substantially below the design temperature due to faulty action of apparatus thermostat or partial failure of steam pressure, etc.
5. When warm ducts are sized without due consideration of partial heating loads or intermediate season operation while low temperatures are

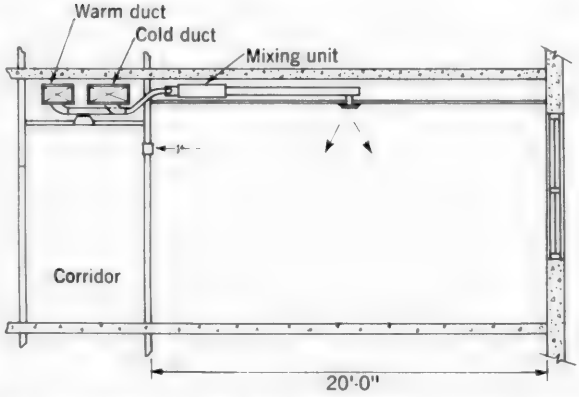

Fig. 6. Scheme A. Dual duct system with overhead distribution.

maintained in the warm ducts.

6. When an excessive temperature drop occurs in warm uninsulated ducts.
7. When a partial or complete obstruction occurs in the warm duct.
8. When the air distributing system is used in conjunction with perimeter radiation there will be an infinite set of operating conditions which may cause a drop of pressures in the warm ducts. This may be caused by improper timing in applying radiation or by inadequate temperatures in the warm ducts or by a combination of both.

It is obvious that in order to avoid the malfunction of the system during cold weather when type *B* control is used, proper provisions must be taken in basic design of the system and/or by addition of safety provisions in control arrangement of mixing units. The cost of such provisions is appreciable but is rather hard to evaluate since it will differ on each installation.

The owning cost of the system will be also affected by the amount of maintenance required to keep the units in proper operating order. It must be recognized that one of the basic disadvantages of high velocity dual duct systems is the multiplicity of control points in relatively inaccessible spaces.

If this disadvantage is augmented by complexity in arrangement of mechanical and functional parts of the mixing unit, the system acceptance by the owner becomes questionable. Equally, the failure to provide an ample and proper access to all working parts of the mixing units for initial adjustment, repair, service and visual inspection makes the system impractical or expensive to own.

System Cost and Floor Area

The high cost of modern buildings imposes an exceptionally high penalty on a system which reduces excessively the usable floor area. The area directly chargeable against an air conditioning system is that taken by the central air handling equipment, by the risers and by the mechanical equipment placed directly on floor at perimeter of the building.

If the dual duct apparatus is designed according to established practices, the floor area required for the central plant will be very moderate. That can be seen in Table 1 where Col. 6 expresses this area in terms of percentage of net conditioned area it serves, and the total charge against a system can be made easily by applying corresponding rate for floor area on that particular application. One of the main reasons for economy in floor area for a dual duct plant is the fact that since no zoning of central equipment is required, relatively large apparatus rooms can serve the building. The large apparatus room can be designed efficiently by utilizing the entire height of the apparatus room for bulky equipment such as coils and filters.

Building designs vary greatly and each one will require its own particular arrangement of shaft or shafts to carry the cold, warm and return air risers. It is not possible to give data to cover all arrangements, but an idea of total shaft areas required for a dual duct system can be obtained from Table 2. This table shows the shaft areas needed for 5, 10 and 15-story buildings having 10,000 and 20,000 ft of net area per floor. This data will be applicable to shafts arranged as shown on Fig. 5. The last line of the Table 2 expresses the total area needed for shafting as a percentage of the net area such shaft serves. The shaft requirements shown on Table 2 apply to systems where supply fans are located in the penthouse. If two air handling plants are provided one on the roof and the other in the basement, the total shaft area needed will

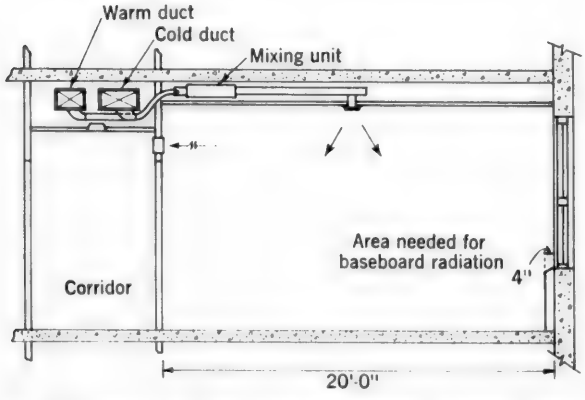

Fig. 7. Scheme B. Dual duct system with overhead distribution and radiation under window.

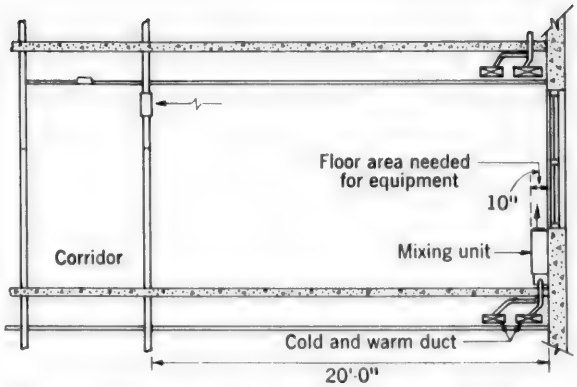

Fig. 8. Scheme C. Dual duct system with perimeter distribution—grille mounted on top of unit.

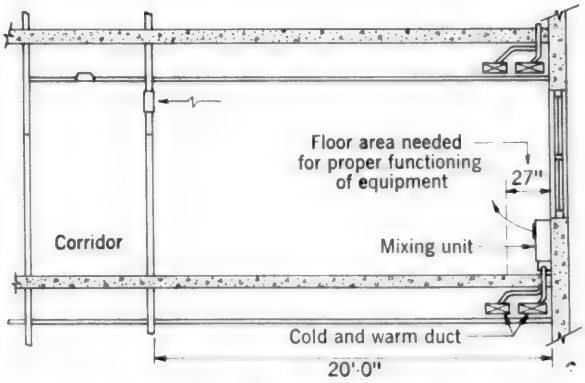

Fig. 9. Scheme D. Dual duct system with perimeter distribution—grille mounted on side of unit.

TABLE 2—SHAFT AREAS NEEDED FOR COLD, WARM AND RETURN AIR

For systems installed in 5, 10 and 15-story buildings having 10,000 and 20,000 sq ft net area on each floor. Air handling plant on roof shaft with arrangement as shown in Fig. 5.

Floor	Building Having 10,000 Sq Ft of Net Area on Each Floor				Building Having 20,000 Sq Ft of Net Area on Each Floor			
	Total Net Area Fed by Riser, Sq Ft	Minimum Shaft Area Required, Sq Ft			Total Net Area Fed by Riser, Sq Ft	Minimum Shaft Area Required, Sq Ft		
		Floors in Building				Floors in Building		
		15	10	5		15	10	5
15	150,000	133			300,000	233		
14	140,000	128			280,000	220		
13	130,000	123			260,000	210		
12	130,000	116			240,000	199		
11	110,000	111			220,000	189		
10	100,000	105	94		200,000	177	165	
9	90,000	100	90		180,000	167	150	
8	80,000	94	84		160,000	157	142	
7	70,000	88	80		140,000	145	130	
6	60,000	80	73		120,000	130	121	
5	50,000	74	69	57	100,000	115	110	94
4	40,000	66	62	52	80,000	102	99	87
3	30,000	57	54	49	60,000	87	85	75
2	20,000	49	46	42	40,000	71	69	60
1	10,000	35	35	35	20,000	49	49	49
Total Shaft Area, Sq Ft		1,359	687	235		2,250	1,120	365
Percentage of Net Area Served by Riser		0.9	0.7	0.5		0.8	0.6	0.4

be reduced approximately by 20 to 30%. Again, the economy of shafting arrangement indicated by Table 2 is mainly due to the fact that dual duct systems do not require central zoning and the air can be handled in large, economical risers.

The cost of floor area taken by the mechanical equipment at the perimeter of the building requires most careful evaluation because it may be a major factor in establishing the owning cost of the system. In modern buildings with continuous glass, any mechanical equipment placed at the perimeter of the building will deduct from the usable area a continuous strip of floor area of varying depth depending on type and functional arrangement of the equipment. Table 3 shows the effect of perimeter equipment for different schemes of dual duct systems on total owning cost of the system. For purpose of comparison, only the cost of exterior zones is shown. These zones are assumed to be 20 ft deep. If the depth of the exterior area is assumed less than 20 ft the penalty of perimeter equipment on owning cost of exterior zone will be proportionally greater than that shown in Table 3. Four basic dual duct schemes, now currently used, are shown for comparison in Table 3 and are diagrammed in Figs. 6, 7, 8 and 9.

Scheme *A*, Fig. 6, represents a plan where all conditioning is done with overhead units, without any mechanical equipment at the perimeter of the building. This scheme can be used in warm climates, and in moderate climates with double glazing. In cost comparison in Table 3 the scheme is referred to as a "base." Of course, when used in moderate climates, the additional cost of double glazing must be added to the cost of this scheme for purpose of comparison with other competitive schemes. No allowance for cost of double glazing is made in Table 3.

Scheme *B*, Fig. 7, shows also an overhead distribution system but with supplementary baseboard radiation under the windows. The average space allowance for this type of radiation and enclosure is approximately 4 inches.

Scheme *C*, Fig. 8, shows perimeter type air distribution with mixing units placed directly on the floor under windows and with supply grilles mounted on top of the unit. The average depth of such units and corresponding "area penalty" is about 10 inches.

Scheme *D*, Fig. 9, is the same as Scheme *C* but where supply grilles are placed on the side of the units. The average depth of such units is the same as that for Scheme C or 10 inches. The extent of space needed in front of the units for functional reasons is debatable, with understandable difference in opinions between manufacturers and users. The current practices for establishing rentable space also will tend to conceal the extent of penalty involved in perimeter equipment. For the purpose of this study,

TABLE 3—ANNUAL COSTS IN DOLLARS PER SQUARE FOOT PER YEAR OF EXTERIOR ZONES FOR DUAL DUCT SYSTEMS

System Arrangement	Fixed Charges (Installed Cost)[1] Col. A			Value of Usable Floor Area[2] Col. B			Operating Cost Col. C			Total Owning Cost (A + B + C) Col. D			% Relationship of Total Owning Cost to Scheme A[3] Col. E		
	High	Low	Avg	High	Low	Avg	High	Low	Avg	High	Low	Avg	High	Low	Avg
Scheme A—Fig. 6	.45	.27	.36	.12	.07	.09	.26	.19	.22	.83	.53	.67	100	100	100
Scheme B—Fig. 7	.48	.29	.39	.24	.16	.20	.26	.19	.22	.98	.64	.81	118	121	120
Scheme C—Fig. 8	.45	.27	.36	.41	.28	.34	.30	.22	.26	1.16	.77	.96	140	142	145
Scheme D—Fig. 9	.45	.27	.36	.88	.62	.75	.30	.22	.26	1.63	1.11	1.33	198	200	215

[1] Total installed cost including refrigeration (20 years depreciation period and 6% interest).

[2] Total floor area taken by the system: Apparatus + shafting + equipment at perimeter windows (area taken by refrigeration equipment not included).

[3] Scheme A is taken as 100% or the base, with the other systems shown as related percentage wise to the base. Figures in Col. D are total owning costs.

17 inches of space was allowed in front of the unit making a total of 27 inches chargeable to the system. If an attempt is made to compare the merits of Scheme *D* with some other methods of perimeter air conditioning, such as induction systems, for example, the same difficulty will be encountered in respect to determining the extent of floor area chargeable to the system. In case of dual duct system, the additional penalty to usable space will be attributed to supply air and in case of induction system to return or induced air drawn into the front of the unit.

As shown by Cols. *A* and *C* of Table 3, the fixed charges and operating costs do not vary greatly for the different schemes shown. However, the value of usable floor area, as shown by Col. *B*, will be drastically affected by the various schemes. Since the allowance for apparatus area and shaft area made in the table are the same for all the schemes shown, the variance in costs for usable floor area as represented by Col. *B*, are due entirely to penalty in perimeter area assigned to the corresponding type of perimeter equipment. The combined effect on owning cost of the system of all components is shown by Col. *D*. It is obvious that the perimeter area penalty will be especially severe when additional floor area is required in front of the unit for functional reasons, as that for Scheme *D*. It is fair to point out that the attractiveness to the owner of perimeter schemes will be further reduced by possible interference with curtains and shading devices, and by relatively higher noise levels obtainable with such equipment in comparison to overhead distribution schemes. Of course, all these penalties and disadvantages do not apply to dual duct systems only, but are equally shared by all air conditioning systems using perimeter air distribution.

System Cost and Building Cube

The penalty which may be imposed on any air conditioning system by the horizontal ductwork is quite appreciable even when only increment cost instead of average cost of a building cube is charged against the system. With high velocity dual duct systems, the building cube penalty can be greatly minimized or avoided entirely by the following provisions in basic design of the system.

1. By judicious location of shaft risers.
2. By splitting warm riser into two duct as shown in Fig. 5 and thus avoiding cross-overs at the most critical points.
3. By confining high velocity ductwork to corridors and areas adjacent to the core of the building where hung ceiling always could be dropped down.
4. By using rectangular ducts with high aspect ratios, if necessary.
5. By using, hung ceilings and/or corridors for the return air.

If the system is designed in this manner it will have another advantage of greater flexibility in respect to future zone changes and will be better acoustically.

TABLE 4—BASIC DATA USED IN CALCULATING ANNUAL COSTS SHOWN IN TABLE 3

Item		Costs in Dollars		
		High	Low	Average
Annual Cost of Floor Area per Sq Ft	Exterior area for perimeter equipment	7	5	6
	Interior area for risers	6	4	5
	Penthouse for apparatus room	5	3	4
Installed cost of system per sq ft		5.10	3.10	4.10
Installed cost of baseboard radiation, excl. boilers, per sq ft		.40	.20	.30
Apparatus room area in terms of area it serves		1.6%	1.6%	1.6%
Riser area, in terms of area it serves		0.6	0.6	0.6
Area for perimeter equipment		See Figs. 6, 7, 8 and 9		
Power cost		2c per kwh		
Steam cost		$1 per 1000 lb		
City water cost		25c per 1000 gal		

Alleys Supplied with Conditioned Air through

Concrete Ducts in Roof Valleys

SHANNON WHEELER
Tulsa, Oklahoma

Fig. 1. Presence of concrete ducts are revealed only by vents. Nine of them in each duct throw air into customer activity area.

Fig. 2. End view of concrete duct. To reduce air friction, valleys that form bottom sides of duct were given a smooth trowel finish. Note metal bar to prevent deflection of duct cover.

USE of concrete air supply ducts sharply cut heating and air conditioning installation costs at the new Harvard Lanes building in Tulsa, Okla. The building is composed of nine, thin-shelled concrete barrels, as illustrated above. Each end (foreground and background in photo) of the building accommodates sixteen lanes. Only the central part of the building, housing bowler seating, grill, and offices, requires comfort heating and cooling.

Because air handling units would be difficult to place where they could supply air directly into the conditioned space; because sheet metal ducts to fit the curved ceiling would be difficult to fabricate; and because round or rectangular ducts were considered architecturally undesirable; the air distribution system was designed to take advantage of the basic structure by covering with insulation two shell valleys and using those valleys as triangular ducts. The valleys so utilized are between the third and fourth and between the sixth and seventh shells.

Vents Create Thermal Barrier

Figure 1 shows some of the nine 24 by 10 inch vents placed along the face of each duct which produce a thermal barrier between the conditioned seating area and the unconditioned area. The thermal screen minimizes loss of conditioned air to the unconditioned area.

A tenth vent on each duct, opposed in direction to the nine others, wipes the west wall of the building to offset solar heat gain in summer. At the east end of each duct, a sheet metal duct extension supplies conditioned air to offices and lockers located in the front of the building. Louvered, double doors return air to the equipment room at the rear of the building.

Ducts Sized a Little Larger

Figure 2 is a duct end view photo. To reduce friction, concrete in duct valleys was troweled smooth. It is esti-

mated that, thus finished, the friction factor approximates that of sheet metal, but to be on the safe side, duct areas are sized 10% larger to compensate for any increased frictional losses.

Figure 3 shows the end of a concrete duct, as in Fig. 2, connected to a sheet metal duct and transition piece located above an air handling unit. Figure 4 is a drawing of the arrangement in end view. Building ceiling is formed by 2-inch Tectum plank. This gives the duct valleys, which are actually part of the roof and ceiling, an overall U-factor of 0.16.

Roof of the duct, 4-inch vermiculite, 1-6 mix, on 1 9/16-inch Thermo-board, is calculated to have a U-factor of 0.05. All roofing is covered by 4-ply membrane roof with white, reflective coating. Round metal bars, set upright in the valleys, prevent deflection of the duct covers.

The two air handling units each feed 10,000 cfm into the ducts at 1,800 fpm. Although this velocity might be objectionable in a theater or auditorium, noise level is not so important in a bowling alley.

Mechanical Equipment

In a climate such as Tulsa's, freezing weather may be interspersed with days ranging into the 70's. A 600,000-Btu boiler provides hot water for the air handlers, and unit heaters are installed at each end of the building, otherwise unheated and unconditioned, to furnish sufficient heat to protect the pin-setting machines.

Year-round cooling is provided by a 50-ton hermetic compressor mounted atop its water-cooled condenser. (See Fig. 5.) An aquastat in the cooling tower storage tank (See Fig. 6.) turns the tower fan on when the water reaches 85 deg F and off when the water falls to 80 deg.

Ryan and Roark & Associates, Architects and Engineers, designed the building and mechanical system. Coday and Company was the mechanical contractor.

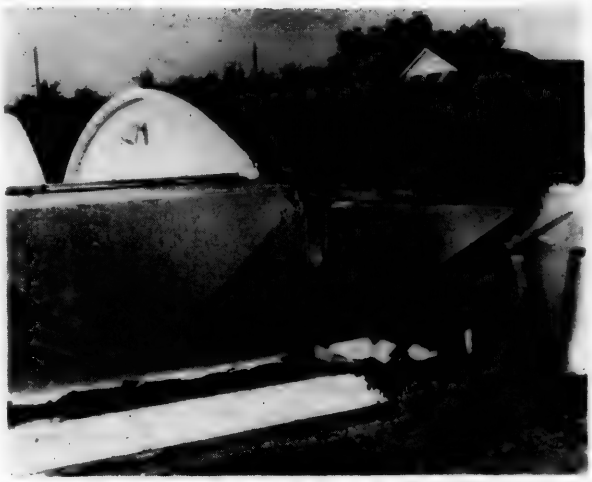

Fig. 3. Sheet metal duct (before insulation) carries air from handling unit, directly below, to concrete duct.

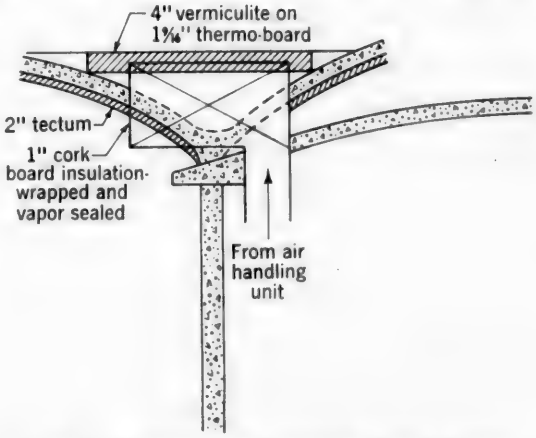

Fig. 4. Cross-section of system pictured above.

Fig. 5. E. J. Coday, air conditioning contractor, looks at 50-ton hermetic compressor, which sits above water-cooled condenser.

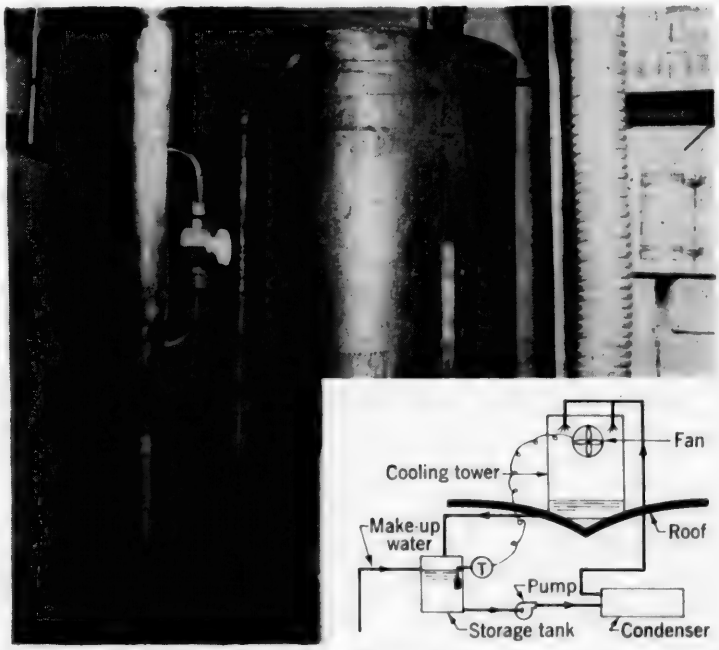

Fig. 6. Inside tank, located in air handling unit room, serves both as storage tank for cooling tower and as make-up water tank. Aquastat in tank controls cooling tower fan. Insert diagrams control system.

When and where to use

Liquid-Suction Heat Interchangers

LEONARD N. BROWN
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There seems to be some confusion as to when and where liquid-suction interchangers should be used in refrigerant systems, especially where Refrigerant-22 is concerned. This article should help clarify the use of this type heat interchanger as part of the refrigeration cycle.

LIQUID-SUCTION heat interchangers are used to accomplish one or more of three functions:

1. *They are used to increase the efficiency of the refrigeration cycle.* This is achieved when the suction gas is super-heated by removal of this heat from the liquid. An increase in volumetric efficiency of the compressor also takes place with the warmer suction gas. With Refrigerant-22 these benefits are less.

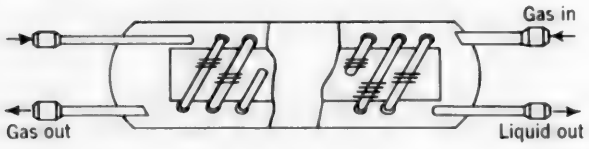


Fig. 1. Shell and finned coil heat interchanger.

Even though efficiency increases take place, they must be evaluated against the effect of pressure drop through the suction side of the exchanger, which forces the compressor to operate at a lower suction pressure. This benefit derived from a heat exchanger is greatest at low suction temperatures. For systems operating in the air conditioning range, they are usually not justified on the basis of increased cycle efficiency.

The interchanger location for this purpose is unimportant. It can be located wherever convenient.

2. *The liquid-suction interchanger also subcools liquid refrigerant for the prevention of flash gas in the liquid line.* This is necessary when excessive pressure drops are present in the liquid line because of friction losses in the piping and liquid lifts that may be present in the piping to evaporators above the receiver.

The recommended location for this purpose is near the condenser or receiver, to achieve subcooling before the pressure drop takes place.

3. *Liquid-suction interchangers are also used to clean up a small amount of expected liquid refrigerant returning from evaporators in certain applications.*

Many heat pump systems, incorporating periodic reversal of the refrigerant cycle, usually include a suction line accumulator and liquid-suction heat exchanger arrangement to trap out large liquid floodbacks, characteristic of these systems, and slowly clean them up between cycle reversals.

If the design of an evaporator is such that a deliberate slight overfeed of refrigerant is required to either (1) improve evaporator performance or (2) return oil out of the evaporator, then a liquid-suction heat interchanger is necessary to clean it up.

A flooded water cooler incorporates an oil-rich liquid bleed from the shell into the suction line for returning oil. The liquid-suction heat exchanger serves the purpose of boiling the liquid refrigerant out of the mixture in the suction line.

The recommended location for the exchanger for this purpose is near the evaporator in a horizontal run.

Types of Liquid-Suction Interchangers

Several types of liquid-suction heat exchangers are available on the market.

The simplest form of heat exchanger is obtained by strapping or soldering the suction and liquid lines together so that counter flow is obtained and by insulating the lines as a unit. To obtain the greatest capacity the liquid line should always be on the bottom of the suction line, since liquid in a suction line runs along the bottom. This arrangement is limited by the amount of suction line available.

Shell and coil or shell and tube type exchangers are quite suitable for increasing cycle efficiency and for

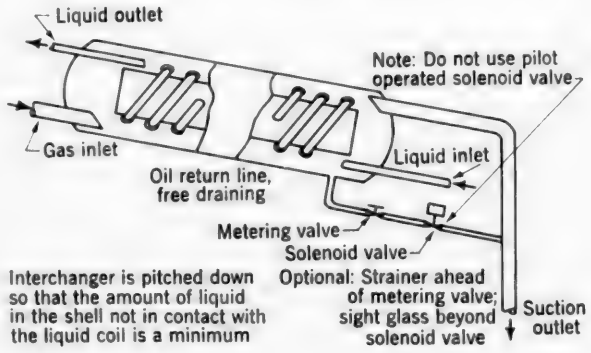

Liquid outlet
Note: Do not use pilot operated solenoid valve
Gas inlet
Liquid inlet
Oil return line, free draining
Metering valve
Solenoid valve
Interchanger is pitched down so that the amount of liquid in the shell not in contact with the liquid coil is a minimum
Optional: Strainer ahead of metering valve; sight glass beyond solenoid valve
Suction outlet

Fig. 2. Shell and finned coil interchanger installed to prevent liquid floodback.

liquid subcooling. A typical unit is shown in Fig. 1. These units are usually installed so that the suction outlet drains the shell, to prevent oil trapping when used for increasing cycle efficiency or for liquid subcooling purposes.

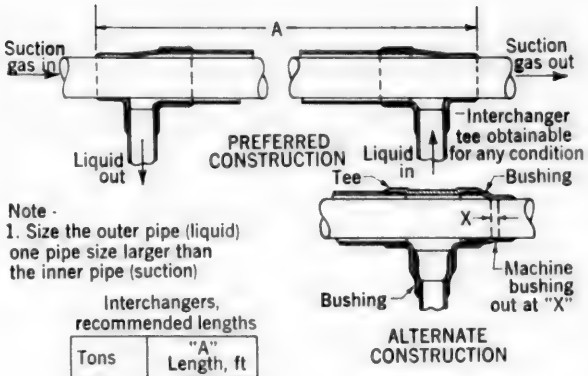
When it is necessary to use this type of exchanger to clean up liquid refrigerant returning in the suction line, however, the free draining arrangement is not recommended. Liquid refrigerant can run along the bottom of the interchanger shell, having very little contact with the warm liquid coil, and drain into the compressor. This situation can be handled by installing a conventional shell and finned coil exchanger as shown in Fig. 2. By installing the interchanger at a slight angle with the horizontal, and with the gas entering at the bottom and out at the top, any liquid returning in the line is trapped in the shell and is held in contact with the warm liquid coil where most of it is vaporized. An oil bleed line with a metering valve and solenoid valve (open only when the compressor is running) is required to return oil which collects in the trapped shell.

The tube-in-tube type interchanger is not as efficient for increasing cycle efficiency, or for liquid subcooling, as the shell and finned coil type. It is, however, quite suitable for cleaning up excessive liquid refrigerant returning in the suction line, especially where this is required with a minimum of suction gas superheat, as with Refrigerant-22. Figure 3 shows typical construction for this type of interchanger with commercially available pipe and fittings.

Where Interchangers Should Be Used

In Refrigerant-12 or Refrigerant-500 systems, the following is general practice:

1. *For Air Conditioning Ranges.* They are usually used only when needed for liquid subcooling or for cleaning up excess liquid in the suction line. They are usually not justifiable for bettering efficiency.



Interchangers, recommended lengths

Tons	"A" Length, ft
50	8
100	12
150	15

Fig. 3. Tube in tube heat interchanger.

2. *For Refrigeration Ranges.* They are always used for increasing cycle efficiency, as well as being useful for the other two functions.

In Refrigerant-22 systems, liquid - suction interchangers are used only when needed for cleaning up excess liquid in the suction line. They should not be used in systems where this function is not necessary. When it is necessary to use an interchanger for this reason, the tube-in-tube type is most suitable.

Precautions

Excessive superheating of suction gas must be avoided with heat exchangers for this will cause excessive discharge temperatures, especially in Refrigerant-22 systems. It is good practice to provide a valved liquid bypass around the liquid-suction heat exchanger, particularly in Refrigerant-22 systems, so that adjustments can be made if it is apparent that there will be overheating.

New Method for Predicting Heat Losses From Floor Slabs

Of basic importance in the use of floor slabs is the accurate determination of heat loss, particularly where direct electrical resistance is employed to heat the space above it, as in an increasing number of new dwellings. Floor surface temperatures may also be of major interest in industrial applications.

Professor Stothe P. Kezios, of Illinois Institute of Technology, and Michael A. Chaszeyka, research engineer with Armour Research Foundation, reported to the recent American Power Conference on an investigation of heat loss through slab floors in which, by the methods of numerical analysis and geometrical electrical analogue, they were able to compare their results with those of Dill, Robinson, and Robinson of the National Bureau of Standards, who, in 1945, reported on heat loss from a full-scale model of the identical slab. In general, the results were in good agreement with those reported by the Bureau. Thus, specialists with a command of the technique and in possession of the necessary equipment can predict the thermal behavior of any particular slab without the necessity of constructing bulky models.

The authors note that heat loss through the edge of the slab to the outside air is approximately 40% of the total heat loss through the slab, in spite of the comparatively small exposed area. Similarly, the complete edge losses are nearly 60% of the total.

Heat losses from ground slabs are more nearly related to length of exposed edges than to surface area. An average 0.81 Btu per (hr) (linear foot of exposed, uninsulated edge) (deg F difference in temperature between indoor and outdoor air) was found to be satisfactory, at least for the mild climates of the Middle Atlantic states.

To realistically predict heat losses from slab floors laid on the ground, using the full slab area and ground temperatures recommended in the ASHRAE Guide, the overall heat transfer coefficient, $U = 0.1$ Btu per (hr) (sq ft) (deg F) apparently must be increased three to five times, the increase depending on ground temperature, the authors state. Regardless of the proper U value, they conclude, use of floor area instead of periphery as a basis for loss calculation is not as sound an approach.

A Russian engineer writes on

Single-Pipe Hot Water Heating

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Part 2 – The Panyushkin Slide Rule

BECAUSE the sizing of single-pipe hot water systems with non-closing bypasses is difficult, various methods have been devised for practical calculations, utilizing tables, nomographs, etc.

The greatest reduction in calculation time is effected by the V. I. Panyushkin slide rule, Fig. 7. It is laid out almost identically to the usual logarithmic slide rule with a medial slide having front- and back-side scales and an indicator.

Figure 7a shows the medial slide face up; Fig. 7b, face down. The indicator is not shown. The following illustrates the use of the slide rule:

Given that, in the system of Fig. 8, there is an available head of 200 mm of water column, that room temperature is 18 deg C, that heat losses are as indicated in the diagram, and that all pipe diameters and heating surfaces are to be determined.

Given, also, that the design temperature of the supply water, t_s, is 95 deg C, and return water temperature, t_r, is 70 deg C, the total heat output of all the elements on the riser will be, summing up the heat losses in the diagram,

$$\Sigma Q = 2(900) + 6(700) + 2(800) = 7600$$

kilocalories per hr.

Sizing the Riser

The quantity of water flowing through the riser, from equation (1),

$$g = \frac{7600}{(95 - 70)} = 304 \text{ kg per hr.}$$

With the aid of the indicator, find, on scale (1)—refer to Fig. 7—the riser pressure, 200 mm. Then, with medial slide face up, as in Fig. 7a, make the flow quantity, 3.04×100 on scale 2 of the slide, coincide with the 200 mm of scale 1.

Next, move the indicator left to one of two arrowhead indices of scale 2, "III-VI", which indicates buildings from three to six stories high.

The slanting indicator line, scale 3, crosses the fifth-story line (the horizontal line marked V3T), at point A, indicating that the riser should be ¾ inch in diameter. If, for example, the pressure were 400 instead of 200 mm, the indicator under the arrowhead would point to B at the intersection of scale 3 and the fifth story line, showing that the riser could be sized ½ inch diameter.

If the building is higher, from seven to nine stories, the appropriate arrowhead and scale 4 are used.

Diameters of the bypasses are chosen one size smaller than the riser diameter, while the diameter of the run-outs to the heating units is always taken as ¾ inch, unless the riser is ½ inch diameter, in which case the connecting piping is also ½ inch.

Determining Heating Surface

Having sized all the piping, there remains the determination of heating surfaces. For this purpose the medial slide is reversed, as in Fig. 7b.

Next, the following calculations are carried out, best explained by illustration. On the fifth floor (Fig. 8) there are two 900-kcal units. The percentage of total riser loading then, above the fourth floor, is

$$\frac{2(900)}{7600} \times 100 = 24\%.$$

Above the third floor, the percentage of total riser loading of the fourth and fifth floors are determined:

$$\frac{2(900) + 2(700)}{7600} \times 100 = 42\%.$$

In like manner, above the second floor,

$$\frac{2(900) + 4(700)}{7600} \times 100 = 61\%,$$

and above the first floor,

$$\frac{2(900) + 6(700)}{7600} \times 100 = 79\%.$$

Then the indicator is positioned on one of the scales which are located either in the top, left, or bottom, left corners of the rule, the choice depending on whether heating elements are connected to both sides or to only one side of the riser. In the present case, the elements are connected on both sides. and therefore the scales in the

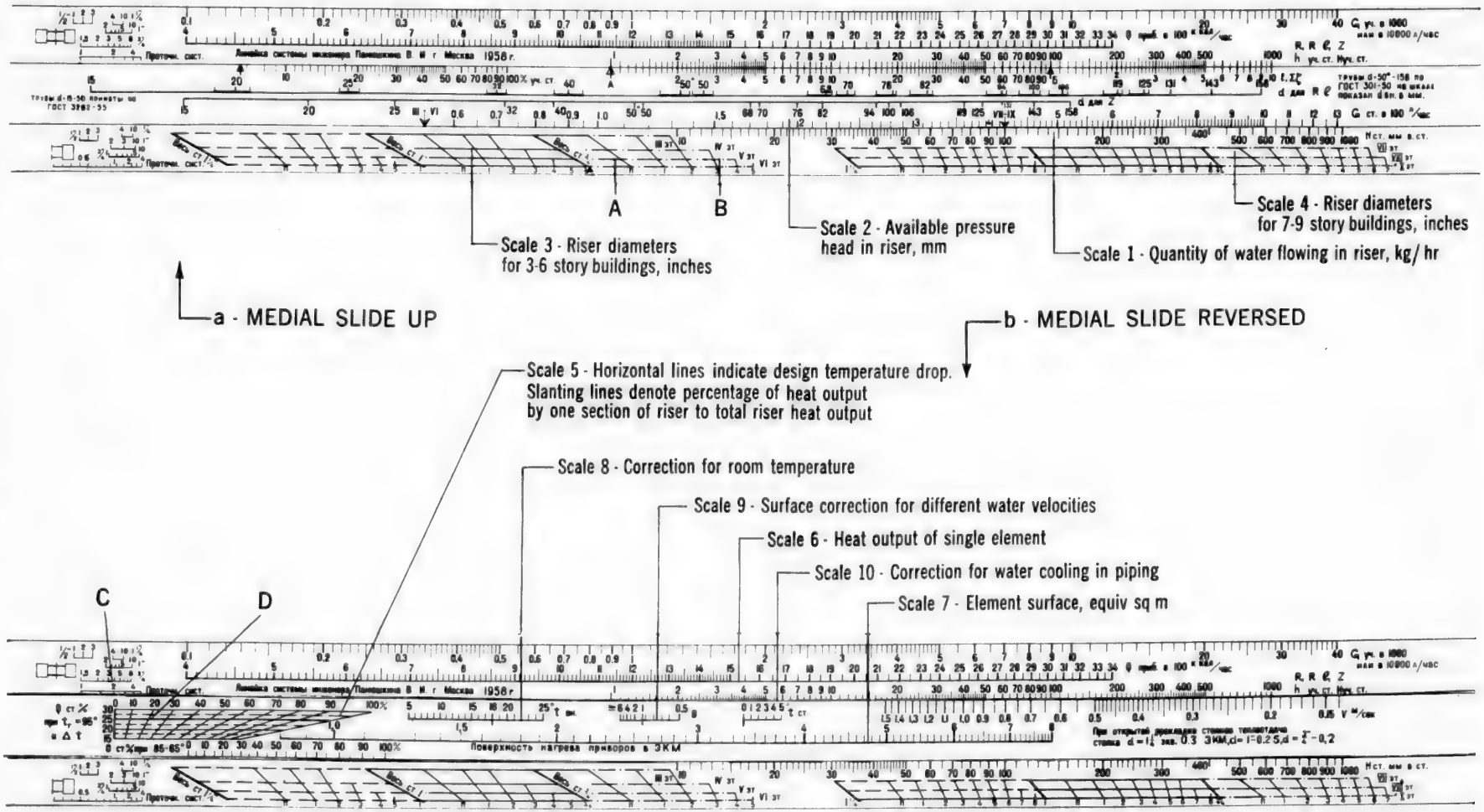

Scale 3 - Riser diameters for 3-6 story buildings, inches
A
B
Scale 2 - Available pressure head in riser, mm
Scale 4 - Riser diameters for 7-9 story buildings, inches
Scale 1 - Quantity of water flowing in riser, kg/ hr
a - MEDIAL SLIDE UP
b - MEDIAL SLIDE REVERSED
Scale 5 - Horizontal lines indicate design temperature drop. Slanting lines denote percentage of heat output by one section of riser to total riser heat output
Scale 8 - Correction for room temperature
Scale 9 - Surface correction for different water velocities
Scale 6 - Heat output of single element
Scale 10 - Correction for water cooling in piping
Scale 7 - Element surface, equiv sq m
C
D

Fig. 7. The V. I. Panyushkin slide rule for calculating single-pipe hot water heating systems: (a) with medial slide turned face-side up, (b) with medial slide upside down. In addition to the ten scales identified, other scales shown are used to determine pressure losses due to friction and other local resistances for all elements of the pipeline, thus eliminating the use of many tables and nomographs previously employed.

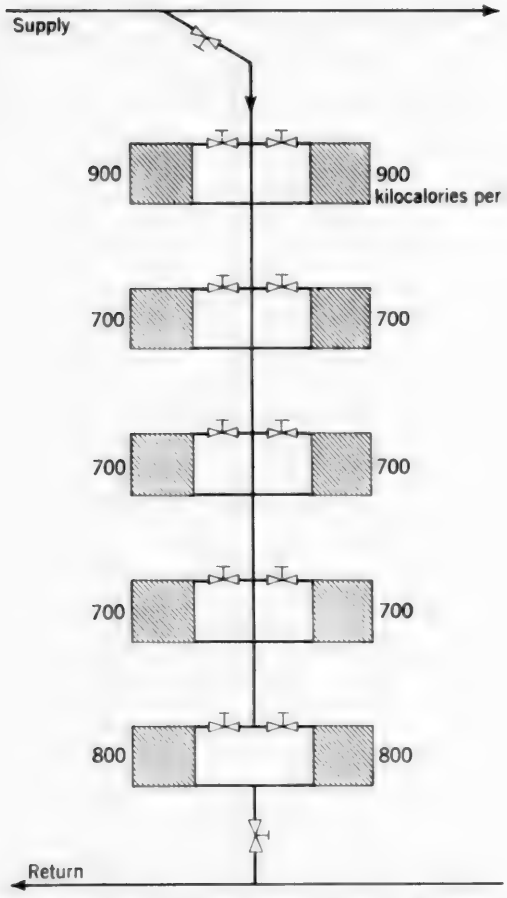


Fig. 8. Riser diagram for sizing problem in text, solved with Panyushkin slide rule.

top, left corner are used. The indicator is positioned on the scale that corresponds to the riser diameter of ¾ inch and to water flow of 304 kg per hr, point *C*.

Next, heating surfaces are selected using scale 5, whose ordinate shows the temperature difference between the riser inlet and outlet water temperatures, (here, 25 deg C) and whose slanting abscissa shows heat output by stories, in percent relative to total heat output.

To determine the surface of the units on the fifth floor, the left index of scale 5 is placed under the indicator. The left index corresponds to 0%, reflecting the fact that the supply water to the heating elements on the fifth floor are receiving water directly from the boiler; that is, that the supply water to the elements has, as yet, borne 0% of the heat load, is uncooled.

Sliding the indicator to 900 kcal per hr on scale 6, (to 9 kcal × 100) the required surface is found on scale 7 below to be 1.79 equivalent square meters. (An equivalent square meter equals 435 kcal per hr under standard testing conditions.)

The surface found applies to the most common indoor condition, 18 deg C. For other room temperatures, a correction factor is applied with the aid of scale 8. For example, if room temperature is 25 deg C, the indicator is moved to 25-deg on scale 8 and a heating surface of 1.91 equivalent square meters is read on scale 7.

To find the heating surface for the fourth floor, the intersection in scale 5 of riser inlet-outlet temperature difference, in this case 25 deg C, and the percentage, as calculated, on 5th floor heat loss, 24%, point *D* of Fig. 7b. This point is positioned under point *C* found previously. Hereafter, the procedure is as in the first case, so that for the fourth, third, second, and first floors, the surfaces are 1.49, 1.68, 1.88, and 2.45 equivalent square meters, respectively.

Other Scales

The reverse side of the slide has a scale (No. 9) that corrects surface calculations for different water velocities in the heating elements; and another, No. 10, that corrects for the cooling of the water in the piping. Other scales, which are not discussed here, are used to determine pressure losses due to friction and local resistances for all elements of the pipeline, so that the rule will substitute for all the well-known tables and nomographs employed in calculating hot water heating piping.

One-Sided Arrangement Favored

The illustrations which accompany this article show two arrangements of heating units on the risers: those with units on one side only, and those that are two-sided. The two-sided arrangement was the most popular until recently. It has been found, however, that the one-sided arrangement, where ceiling heights are less than 9 ft and the heating elements are close to the riser (1 to 1.5 ft) is the better practice.

Further, risers in apartment houses up to five stories employ, as a rule, the lesser diameter of ½ inch when the one-sided arrangement is employed. Moreover, use of the ½-inch standard riser makes standardization possible.

Disadvantages of One-Pipe Systems

One drawback of single-pipe hot water heating systems is that they are more sensitive to fluctuations of the hot water supply than two-pipe systems. A decrease in the flow of water into a two-pipe system results in a more uniform decrease in the output of all heating units, whereas the same decrease has little effect on the heat output of units in the upper portion of the single-pipe system, and an increasing effect on the heat output of the lower elements. An identical discrepancy is caused by an oversizing of the upper elements in a riser, causing them to emit excessive heat and starving the lower elements.

A decrease in heat output of heating units on the lower floors is especially apparent on days when outside temperature is lowest, with increased infiltration into the lower stories of the building adding to the heating losses.

Because of this drawback, central regulation of single-pipe systems, by regulation of flow quantities, is quite difficult.

Another drawback often cited has, in practice, been found rather insignificant. Without special provision, none of the units on a riser can be used until the supply line, located under the top floor ceiling is installed. However, as erection of succeeding floors proceeds, and heat is needed, as in winter construction, a temporary flow line has been successfully employed which is gradually shifted to upper floors until the building is completed.

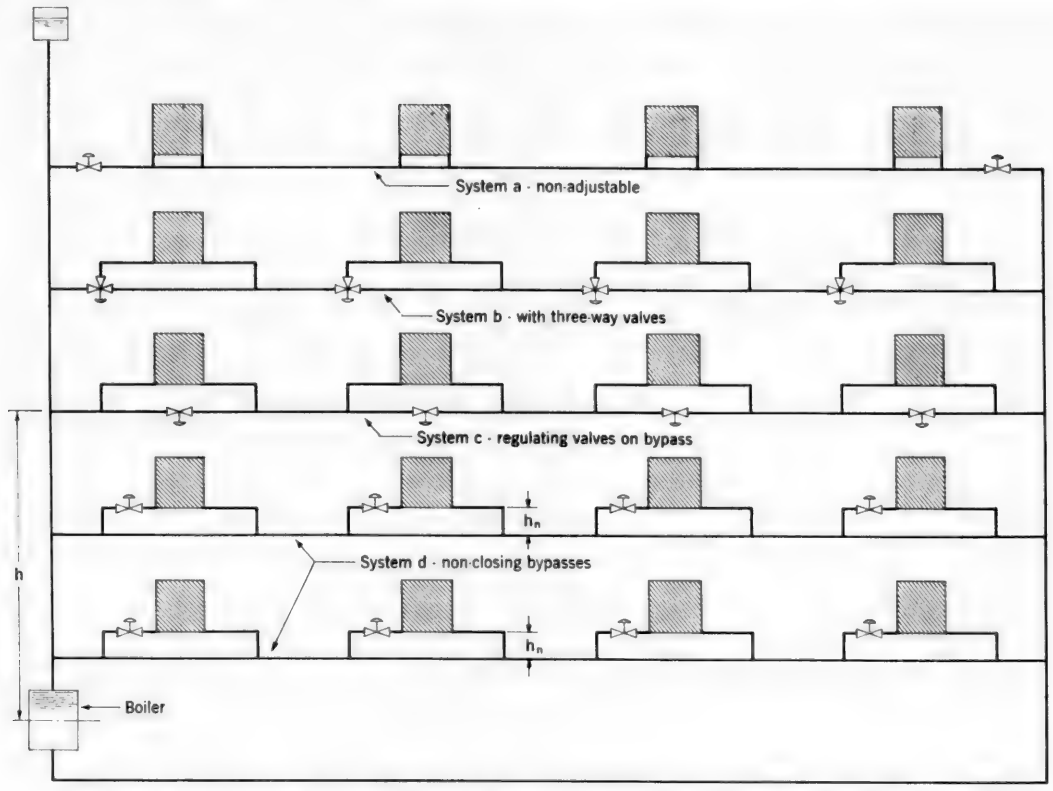


Fig. 9. Horizontal, single-pipe, series-flow hot water heating systems ordinarily used in buildings of less than four floors. Systems *a*, *b*, and *c* are the counterparts to the systems shown in Fig. 1, 2, and 3, Part 1 of this series.

Horizontal Systems

Single-pipe vertical systems are applied to buildings four stories and over. It is more expedient to employ either two-pipe systems or single-pipe horizontal systems for lower buildings.

In Fig. 9 are shown several types of single-pipe horizontal systems. The three uppermost systems are of the type in which the heating elements cannot be completely shut off; the one at the top, *a*, being non-adjustable; the next, *b*, being controlled by three-way valves; and the third, *c*, having regulating valves on the bypasses. These systems operate in the same way as the vertical systems shown in Fig. 1, 2, and 3, correspondingly.

Calculations for systems *a*, *b*, and *c* of Fig. 9 are similar to those for the vertical systems of Fig. 1, 2, and 3, except that, in contradistinction to vertical systems, gravity head is greater on the upper floors. The head, H_{nat}, can be found from the formula

$$H_{nat} = h(w_r - w_s) \qquad (11)$$

where H_{nat} = the gravity head
h = elevation (see Fig. 9) from boiler to horizontal line in question,
w_r = density of return water, and
w_s = density of supply water.

There are some specific features of horizontal systems that ought to be borne in mind when performing calculations. When hot water is supplied to the lower portion of each heating unit, provided the unit is of sufficient capacity, the temperature of the water throughout each unit is approximately equal, the average temperature being very close to the temperature of the water leaving the unit. This lack of temperature drop through the element necessitates an increase in its surface, a characteristic disadvantage of the horizontal system.

The quantity of water flowing through each horizontal line, and its temperature, as it flows through the heating elements, are determined by formulas (1) and (2), as presented in Part 1 of this article, except that it is understood that the horizontal line is substituted for the riser.

Systems *d* in Fig. 9 have non-closing bypasses and operate in a similar way to the vertical system illustrated in Fig. 5.

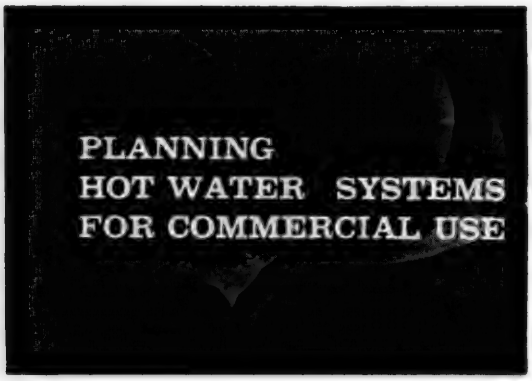
In addition to the drawback that it requires more heating surface, the single-pipe horizontal system involves the installation of an air vent on each heating unit and also presents difficulties in the layout of piping, which must run either over the floor of the story to be heated or under the ceiling of the floor below. Nevertheless, the system is advantageous in buildings of a few stories and especially in one-story houses.

Design water supply temperatures for residential and public buildings in the Soviet Union are 203 and 158 deg F, though in some rare cases, a supply water temperature of 194 deg F is used in residences. In residential and public buildings with stricter hygenic standards, these temperatures are reduced to 185 and 150 deg F, correspondingly.

(Series concluded)

"WEATHER OR NOT". New York City's new Guggenheim Art Museum provides only one example of modern air conditioning in this motion picture film produced by the National Association of Manufacturers in cooperation with the Air-Conditioning and Refrigeration Institute. Produced as one issue of the Peabody Award winning television series, titled "Industry on Parade", the 13.5 minute film describes the benefits of air conditioning in the home, office, store, hotel, factory and elsewhere, and also publicizes the ARI Unitary Air-Conditioner Certification Program and Seal. ARI suggests you check with program directors of stations carrying the NAM series as to when this film, numbered 487 in the series, will be telecast in your area.

Picture Paragraphs



"PLANNING HOT WATER SYSTEMS". This 16-mm full-color sound movie is available to engineers, architects, plumbing designers, and anyone interested in application and installation of commercial hot water systems. The 30 minute film provides information on the latest trends in hot water supply system design, heater specifications, and other facts which will help the viewer do a better job of correctly designing a hot water supply system. Prints are available by contacting your nearest district office of the A. O. Smith Corp., or by writing to Permaglas Div., A. O. Smith Corp., Kankakee, Ill.

"BUILDING WEATHER". Shown here is part of the test apparatus used by Armstrong Cork Co. in its continuing research into the problems involved in insulating air conditioning systems. Latest results from the study have been incorporated into sound, strip film which, in 16 minutes, covers the development of normal inside design conditions along with a review of many of the problems involved in insulating air conditioning systems. This non-commercial film is available by contacting Department BW, Armstrong Cork Co., Lancaster, Pa.

CENTRIFUGAL FAN APPLICATION GUIDE: PART 3—

Will the Fan Be Noisy?

C. J. TRICKLER
Chief Engineer, The New York Blower Company, Chicago, Ill.

In Part 3 of this five-part series, the author develops a simple and practical approach to the problem of fan noise. Four rules for specifying the quietest possible condition are given. Five rules cover the question of acoustical treatment.

MOST OF THE NOISE coming from ventilation systems is created directly or indirectly by fans. Up until a few years ago, systems that were to be installed in noise-sensitive areas were given what now would be considered primitive treatment and consideration. Recent development of high pressure ventilation has so increased the noise problem that the system designer is faced with a confusion of formulae, theoretical dissertations, and new product developments.

Although theoretical and experimental work being done on noise emanating from, and absorbed by, various products and materials and spaces will eventually be resolved into methods of designing quiet systems, there are as yet too many conflicting ratings and too little knowledge to allow the system designer to put much faith in anything but his own experience.

The ventilating system designer striving for a quiet system doesn't really need a great deal of acoustical theory. He does need to exercise good judgment in evaluating both the requirements of his system and the actions of the system's components.

Fans create noise in three ways and transmit the noise to the listener by various paths.

Air turbulence noise created inside the fan and radiated up and down the connecting duct is the type of fan noise most important when ventilated areas serviced by the fan must be quiet. Its effect in the areas not serviced by the fan is usually negligible.

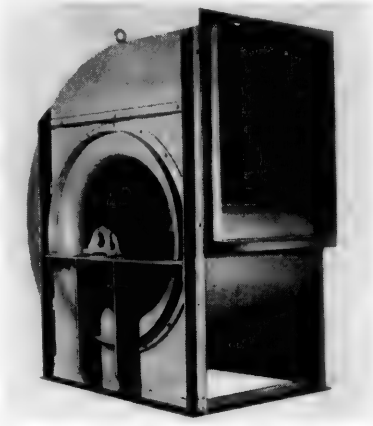


Fig. 1. Forward curve fan.

Mechanical noise caused by fan motor, bearings, and drive can be transmitted through the ducts to the serviced areas. This is particularly significant if fan, motor, and drive are in a plenum. Even if not in the plenum, they can transmit noise through the fan shaft to the fan wheel, which will radiate the noise to the air stream.

Mechanical noise can also be transmitted to the serviced space through the duct itself. This has been long recognized and has been remedied by the use of flexible duct connections.

Vibration caused by fan, drive, or motor unbalance, or by faulty bearings, can be transmitted to the building structure. Once released to the structure, its paths are often unpredictable. (This will be fully treated in Part 4, *Will The Fan Vibrate?*, which will deal with vibration and isolation bases.)

What type of Fan Is Quietest? What about Airfoil Fans?

The three types of fans offered for ventilating work all use the same shape housing and are distinguished only by the differences in their blade shapes and operating characteristics. The oldest one, historically, has forty to eighty small curved blades that discharge the air ahead of the wheel at a velocity higher than the wheel tip speed. This is the forward curve fan shown in Fig. 1. (Refer to Part 1 of this series for a more complete description of fan types.)

Alike in general design and operating characteristics, the other two types both have relatively few blades inclined backwards with relation to wheel rotation. One has constant thickness blades, while the other has airfoil cross section blades. (See Fig. 2 and 3.)

Each of these three fans has characteristics that make it the best selection for specific applications, but for noise consideration in ventilating systems, only the forward curve and airfoil fans should be considered. The flat, constant thickness blade fan is primarily used for industrial processes where its rugged welded steel wheel is resistant to abrasion and erosion that can cause industrial system stoppages.

Air turbulence is created at five places in a fan: (1) at the inlet to the wheel, caused by the cutting action of the blades; (2) along the

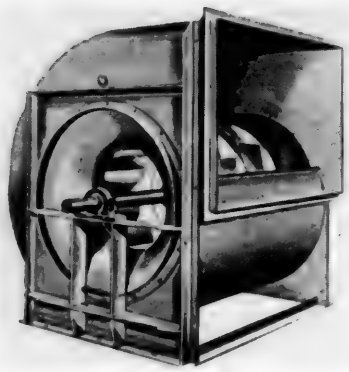


Fig. 2. (left) Double-width fan with flow nozzle, air foil wheel.

surfaces of the blades, where air tends to separate from the blades; (3) at the exit of the blades, where the streams flowing from each side of each blade merge; (4) within the fan housing, as the streams from the wheel change direction and speed; and (5) at the cut-off or tongue of the fan housing, where fan blades are nearest the housing, and non-uniform velocities flowing through the blade channels cause a pulsing action against the cut-off or tongue.

Figures 4 and 5 show how air flows through forward curve and flow-nozzle airfoil wheels. Velocity vectors are drawn to scale for wheels of the same diameter operating at their quietest points of ratings and both delivering the same air volume.

Notice how the air, approaching the inlet of the flow-nozzle wheel, is aligned with the back side of the blade. This accounts for this fan's quiet and stable operation. Full, uniform flow from all parts of the blade channels makes the flow-nozzle airfoil particularly free of pulsing at the cut-off. Notice, also, that the absolute velocity of air flowing from the forward curve wheel is 45% higher than that flowing from the airfoil wheel.

The forward curve wheel develops 2.1 times as much velocity pressure at the wheel exit as does the airfoil wheel, and 17 times as much wheel exit velocity pressure as will be used as fan outlet velocity pressure. The loss incurred in converting the velocity pressure to static pressure within the fan housing is the reason forward curve fans are less efficient than are airfoil fans.

These facts would seem to make the airfoil fan a better selection,

Fig. 3. (below) A constant-thickness blade wheel.

and they do for those cases where the mechanical noises created by the bearings and drive are minor considerations, as they are in a large fan. But since the airfoil fan has to run about two times as fast as the forward curve fan to develop the same rating, it causes the development of excessive mechanical noises in small sizes, particularly at high pressures.

An 18-inch diameter airfoil fan, to develop 6 inches static pressure, must run at about 2400 rpm, while the forward curve fan runs at only 1300 rpm. Although the airfoil fan is probably quieter than the forward curve fan aerodynamically, it will be far noisier mechanically. In small fans, the slower running characteristic of the forward curve fan lends itself to quiet selection of motors, drives, and bearings. The forward curve fan is also well suited for packaged or cabinet arrangements, in make-up air or air conditioning systems, where long shafts are required. Its slower speed means higher capacities and pressures with a given shaft diameter and bearing span.

Conversely, the faster running speeds of airfoil fans lend themselves to good motor and drive selections for larger fans. A 60-inch diameter airfoil, developing 6 inches static pressure at 750 rpm, will use a quieter (and more economical) drive and motor than will a 60-inch forward curve fan at only 400 rpm.

The point at which one fan is a better selection than the other is obviously indistinct, but generally an airfoil fan should be used when the wheel diameter is about 27 inches and larger.

How Can a Fan Be Specified to Be as Quiet as Possible?

Ever present in any engineering design is the evaluation of competitive equipment. When the design considers noise, then the noise produced by the equipment must be rated so it can be compared. It also must be rated so the designer can consider how much acoustical treatment is needed.

Air Moving and Conditioning Association, the American Society of Heating, Refrigeration and Air Conditioning Engineers and others are at work to solve the many knotty problems that at present make any fan noise rating of questionable value. Although most fan manufacturers have noise test data on record as taken in their own laboratories, they are reluctant to publish it because they know it is of value only insofar as it is compared to other tests in their laboratory. Tests of identical fans in different laboratories will yield different results because testing methods have not been adequately standardized. If pressed to offer his test data to clinch a sale or "because all the other fan manufacturers do," the fan manufacturer will submit data with the hope that the engineer that asked for it realizes there is no standard method of rating fan noise. Instead of specifying maximum values or requesting noise ratings, the system designer should follow these simple rules:

1. Select the fan that the fan manufacturer recommends as quietest for a specific CFM and SP requirement. Disregard outlet velocity or use the guide shown at the end of Part 1 of this series. Manufacturers offer performance tables that show only the quietest size selection for each rating.

2. Select a fan with a broad range of quiet operation. This usually means an airfoil fan designed along the flow-nozzle concept. The airplane wing design often yields narrow ranges of quiet operation with excessive turbulence or instability outside of this range. A broad range of quiet operation is insurance against excessive noise resulting from system pressure error or change.

3. Specify that the fan must be tested and rated in accordance with the standard test codes of Air Moving and Conditioning Association, and be approved to bear the AMCA Certified Ratings Seal. Use of this seal indicates that similar fans have been tested in an AMCA-approved laboratory, and that test data has been submitted to the AMCA office for review and approval. Use of the seal also indicates the manufacturer has signed a licensing agreement with AMCA which states that all products sold under and in connection with the license seal shall perform within a specified tolerance to the data submitted to AMCA. If a check of the manufacturer's products by AMCA shows that production quality control is not being maintained within this tolerance, AMCA has the right to revoke the use of the seal. Any fan manufacturer may obtain the seal for his products providing he submits the proper test data to AMCA. The costs are far from prohibitive.

4. Where airfoil fans are used for ventilating or air conditioning systems, it is wise to specify heavy welded steel housing construction and welded aluminum wheel construction. This gives the best combination, and rigid but light-weight rotating parts that create a minimum of vibration. The new alloys of aluminum allow welded airfoil wheels to be made that weigh about one-fourth as much as the same size steel wheels. This means that the same degree of balancing will result in one-fourth the vibration.

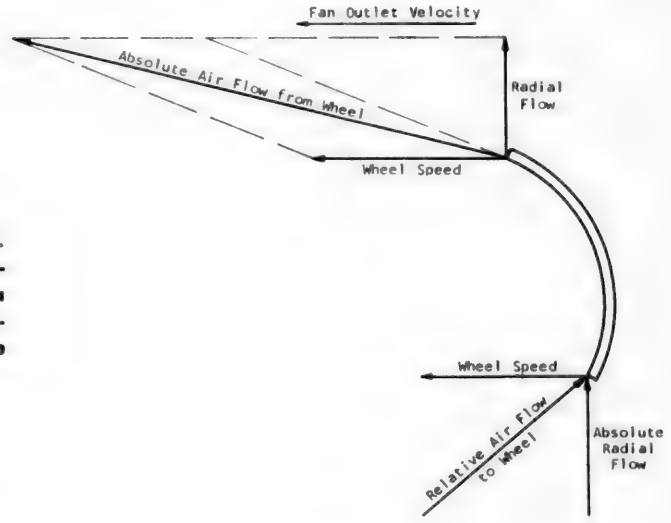
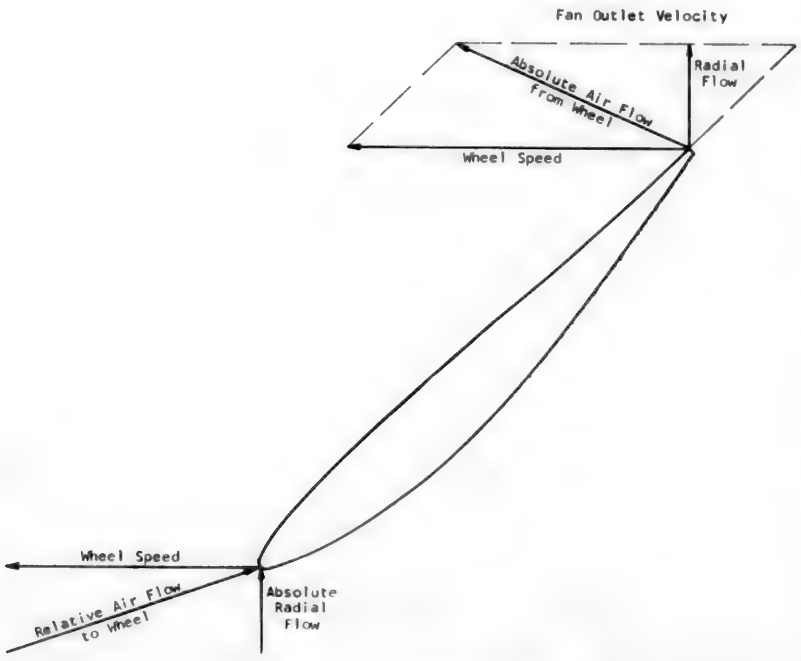


Fig. 4. (right) Flow through a forward curve wheel. Velocity vectors are drawn to the same scale for comparison with those in Fig. 5, below, which represents a flow-nozzle wheel of the same diameter. Each fan is operating at its quietest point; both are delivering the same volume of air.

Fig. 5. (below) Flow through a flow-nozzle wheel.



Will Bearings, Motor or Drive Be Noisy?

These three can create objectionable noise, especially if located at the fan inlet or in an inlet plenum. Too much attention is paid to bearing noise, perhaps too little to motor and drive noise.

Although no bearing is quieter than a good sleeve oil bearing, the latter's quietness is much overemphasized. Recent laboratory tests, designed to compare the overall noise of a fan equipped alternately with sleeve and ball bear-

ings, failed to indicate any difference in noise measurements even though the noise level microphone was held only a few inches from the bearings. Improvements made in anti-friction bearings in the last few years have made the added expense of sleeve bearings seem a waste of money on ventilating applications. (New York Blower *Engineering Letter No. 14*, "Ball, Roller and Sleeve Bearings for Fans and Motors," covers this in detail.)

For several years the V-belt drive industry has been improving belt and sheave quality without claiming the resulting increased drive ratings. Thus V-belt drives have become progressively quieter. Since the V-belt drive industry is now in the process of decreasing belt cross-sections or increasing belt ratings, it raises the possibility that fan designers and users will have to return to the old policies of oversizing drives to keep them from "squealing" on starts and "singing" while running. It would probably be wise for them to size the new drives generously until field experience has been gained.

The quietest motors are the totally enclosed, non-ventilated ones. This is because the motor housing damps magnetic noise, and there is no fan to create air noise. The open motor is next in quietness, and the fan-cooled motor is the noisiest.

Both 1800- and 1200-rpm motors are quieter than other speeds. Three-phase motors are much quieter than single-phase motors because they work without switching mechanisms and with lower magnetic densities.

How Much Acoustical Treatment Will The System Need, And How Should It Be Used?

Acoustical treatment of ventilation systems runs the gamut from the little or no treatment required for industrial installations or low pressure systems to the ultimate needed for libraries, broadcasting studios, etc. How much is necessary is generally a matter of experience and common sense. Nowhere is the theoretical approach as overdone as it is in the acoustical design of duct systems. A few simple rules should suffice for all but the most delicate installations.

1. Start with the selection of the quietest fan as recommended by the fan manufacturer. If the fan is to service a quiet area and is operating at more than a couple of inches pressure, it should probably receive some acoustical treatment.

The farther the fan is from the quiet area, the higher the pressure that can go untreated. A fan separated from the quiet area by a couple of hundred feet of duct with normal amounts of duct turns will probably not need treatment until it exceeds five inches pressure. This is not to say that treatment will not be needed to overcome duct or grille noise. Here we are discussing only fan noise.

2. High-frequency sounds are more distracting than low-frequency sounds. If one listens intently to the noises around him, he will become aware of low-frequency sounds otherwise not noticed. Sometimes low-frequency noise is desirable to mask other noises, but high-pitched noise is always objectionable.

In nature, trees and air attenuate high-frequency noises. A train whistle a mile or two away sounds very low pitched because of this. Perhaps this process of high-frequency attenuation trains one to ignore low-frequency noises.

Acoustical products, like nature's, tend to attenuate high frequency noises and pass the lower ones. Thus, to attenuate only the more objectionable high-frequency noises, one can work with a minimum of acoustical products, while if required to eliminate all noise frequencies, one must adopt to more complex methods.

3. Acoustical material with its surface parallel to the direction of travel of noise is not as effective as if placed with its surface perpendicular to the travel. Hence, one treated elbow is more effective than a long run of treated straight duct.

Inlet and outlet plenums often offer ideal locations for acoustical treatment. An inlet box of ample proportions with turning vanes to maintain good flow (see Part 2 of this series) and with walls and vanes treated will do a good job. Likewise, the first elbow on the fan discharge may be fitted with vanes, and all surfaces covered. An allowance must be made in extra cross sectional area for the thickness of the acoustical material.

4. Particularly sensitive systems, or those with high pressure fans servicing nearby quiet areas, may need inlets and/or outlets treated with one of the modern packaged acoustic traps. Although often more expensive than the fan, these traps do a good job. The user should be cautioned about two facts not usually recognized:

a. Ratings of pressure losses against CFM are based on even flow distribution into the trap inlets. When they are placed directly on fan outlets, the naturally uneven fan velocity distribution increases pressure loss considerably. At the same time, the trap prevents the fan from developing its full pressure ratings. Traps should never be placed directly on the fan outlet. They should be placed several duct diameters away.

b. Air discharge from acoustic traps is non-uniform. The velocity pattern depends upon the path through the trap. When a trap is placed directly upon the fan inlet, it will usually cause eccentric fan wheel loading and loss in capacity similar to that described in Part 2 of this series for elbows and inlet boxes.

5. Lastly, mechanical noise that emanates from high-pressure fan systems and travels to other parts of the building through walls and floors must be considered. A high-pressure fan, perfectly treated as far as noise going upstream or downstream, may still be a nuisance if it sounds noisy in the next room or on the floor below. It will require careful vibration isolation and may require some sound absorption treatment between rooms.

(Part 4 follows next month)

AIR CONDITIONING HOSPITALS

AIR CONDITIONING, HEATING AND VENTILATING'S REFERENCE SECTION

Air Conditioning Hospitals

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Various types of air conditioning applications are found in hospitals, each area with its own operating factors and each requiring special design considerations. Because pathogenic bacteria can be spread through the air distribution system, ventilation requirements are important considerations for the air conditioning system. Each of the special hospital areas such as the operating rooms, nurseries, research laboratory, radiology rooms and patients' rooms are discussed separately, with basic design data included. Tables summarize design conditions for air conditioning and ventilation.

HOW much air conditioning should a hospital buy with the limited funds that are made available for this purpose?

This is but one of the many important questions that must be answered during the preliminary stages of engineering design.

Even though there may be a tendency to limit the amount of air conditioned space in a hospital, experience has demonstrated that many hospitals substantially increase the amount of air conditioned areas shortly after its initial occupancy. This results in a much greater cost for air conditioning, than if it were planned initially with the base building. During the preliminary stages, it is wise to consider space for the following items, not only to meet immediate conditions, but so that ultimately the air conditioning facilities can be expanded with a minimum of redesigning of the existing structure:

1. Boiler capacity
2. Space for fan rooms, pipe and duct shafts
3. Refrigeration room
4. Cooling tower
5. Duct distribution

In an effort to keep costs down, it is good judgement not to sacrifice quality and reliability of essential mechanical equipment. A hospital requires that heating and air conditioning equipment, as well as other mechanical units, must be as trouble-free as possible. Where necessary, spare equipment must be provided to maintain 24-hour uninterrupted service.

The areas frequently included in minimum air conditioning are:

1. Operating rooms
2. All areas including corridors normally considered a part of the surgical suite
3. Recovery rooms
4. Delivery rooms

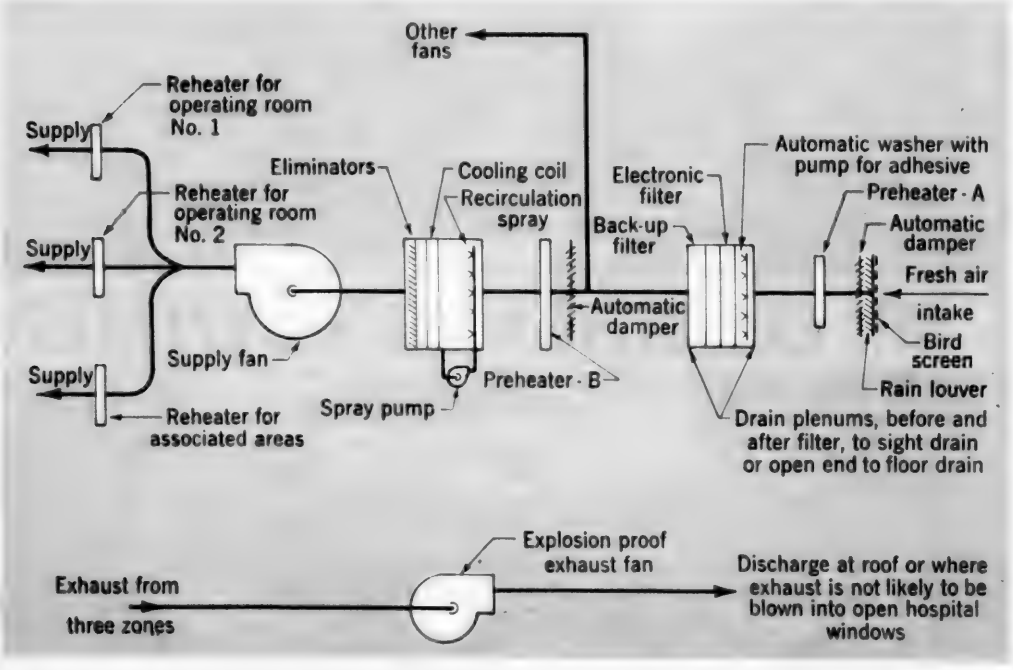

Fig. 1. Diagram of an air conditioning system serving operating rooms.

5. All areas including corridors normally considered a part of the delivery suite
6. Labor rooms
7. Central sterile supply
8. Constant temperature and/or humidity rooms

Operating Rooms

Frequently, local codes and the Public Health Service set the minimum design criteria for operating rooms. The system serving this area should have high quality filtration, good control of temperature and humidity, a minimum of eight air changes per hour, and no recirculation of air.

Ideally, each operating room should have its own air conditioning system, so that optimum control of temperature and humidity can be maintained. Economically, however, this arrangement is quite expensive as well as space-consuming and, therefore, difficult to justify. A system serving two or more operating rooms as well as associated areas, is found to be comparatively economical, and quite capable of maintaining the desired conditions within acceptable limits.

A well designed operating room system will generally include the following basic features:

1. 100% fresh air
2. Preheaters
3. Electronic filter, with automatic filter washer (or some other type of high efficiency filter)
4. Recirculated spray type cooling coils with eliminators
5. Fan selected for quiet operation
6. Reheaters for each zone
7. Explosion-proof exhaust fan

Reference should be made to Fig. 1 which shows diagrammatically air conditioning systems for operating rooms.

Locating a preheater before the electronic filter is desirable for freeze protection of the automatic filter washer. This location, however, has a minor disadvantage in that the preheater will require an occasional cleaning.

A single electronic filter may be selected to serve more than one operating or delivery room fan system for economy purposes. However, there is the possibility of forming an excessive amount of ozone when running only one supply fan system which has a capacity below the minimum filter capacity recommended by the manufacturer. It is therefore desirable, to carefully design at least one system sufficiently large to avoid this. A system serving one or two operating rooms, and all of the areas associated with surgery, will very likely run 24 hours a day and have sufficient capacity to minimize the possibility of forming an excessive amount of ozone.

Preheater *B* shown in Fig. 1 is used to control the humidity of the area served by the fan system. The coils should be selected to control the air temperature between 55 and 135 deg F. Adiabatic cooling of the air in the sprayed coil section of the system, cools the air to the desired supply temperature and at the same time absorbs sufficient moisture to maintain the necessary humidity. Accurate control of humidity throughout each of the spaces served by the fan is generally not considered essential; so a humidistat located in the exhaust air duct can provide adequate control. Although only one condition of either temperature or humidity can control the fan discharge temperature, the conditions within the rooms will be close enough to satisfy requirements.

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A pneumatic control diagram for operating room systems is illustrated in Fig. 2.

Operating rooms generally have widely fluctuating lighting and population loads and therefore, require individual reheat zones. Under no circumstances should temperature control of an operating room be done with volume control, since this would adversely affect the pressure balance, air distribution and the ventilation rate within this critical space.

The location of ceiling diffusers must be carefully coordinated with room lights, surgical lights, and any other apparatus required to be ceiling mounted. One satisfactory method of air distribution using four diffusers, carefully baffled to avoid drafts, and selected for low sound level, is shown in Fig. 3.

A negative pressure within an operating room is undesirable, since dust laden air will be drawn into the room through doors, windows and walls to cause contamination. A substantially positive pressure has the serious disadvantage of spreading anesthesia odors throughout the area, and therefore should be avoided. The ideal condition is an equal or at most a very slight positive pressure within the operating room.

Fifty per cent of the exhaust air should be taken from a point near the floor to remove anesthetic gases which are heavier than air. The remaining quantity of air should be exhausted near the ceiling to remove lighter than air anesthetics and other fumes and odors collecting near the ceiling.

Surgical Areas

All areas generally considered a portion of the surgical section, including scrub-up, sub-sterilizing, corridors, nurses station and recovery rooms, should have the same temperature and humidity conditions as the operating rooms for the following reasons:

1. The danger of anesthesia explosion is minimized when the humidity is maintained at approximately 55% R.H.
2. It is desirable that post-operative patients not be subjected to great variations in temperature and humidity while being moved from operating room to the recovery room.
3. Temperature and humidity conditions within the operating rooms may be maintained with the least

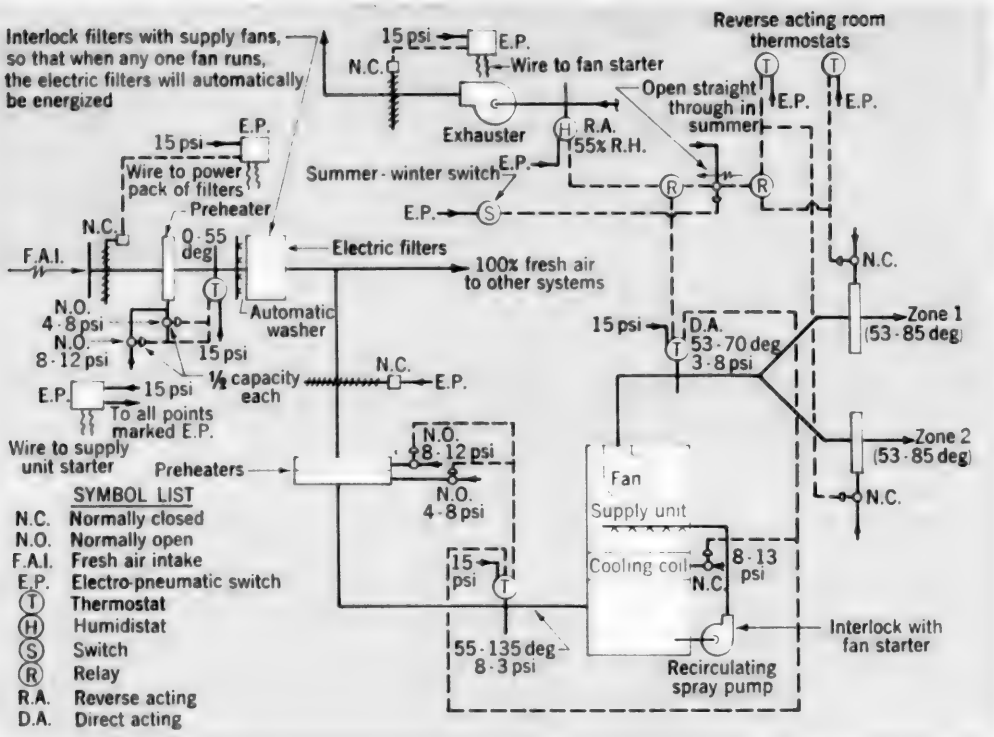


Fig. 2. Pneumatic control for air conditioning system serving operating rooms.

amount of variation when surrounding spaces have similar design conditions.

Recovery Area

Due to strong odors from anesthesia, among other things, it is best not to attempt to recirculate air from this area. High humidity conditions are, of course, desirable in these spaces to minimize the danger from anesthesia explosion. Temperature control for each recovery room is a worthwhile consideration in order to provide optimum comfort for the post-operative patient.

Delivery Rooms

Air conditioning systems serving the delivery rooms, labor rooms and other associated areas should have the same basic design features described for the operating room systems and associated areas (Refer to Fig. 1). Design criteria for delivery rooms are the same as those for operating rooms.

Central Sterile Supply

There are several valid reasons for including this area with areas recommended for "minimum" air conditioning. The cleanliness that an air conditioning system provides for this zone is of course extremely desirable, and when one realizes that the heavy heat concentrations around sterilizers require that considerable quantities of air be exhausted, it follows logically that an extensive, filtered, zoned air supply system is mandatory. Only a relatively small additional expenditure then becomes necessary to provide cooling coils and sufficient refrigeration capacity for suitable air conditioning and comfort to hospital personnel who otherwise would have uncomfortable conditions.

Properly designed hoods located over sterilizers will reduce the latent and sensible loads within the area to justify the expenditure for hoods. Care must be taken in the design of the hood to prevent condensation from dripping along the periphery. A pitched, drained, gutter will eliminate this problem.

The location of supply and exhaust outlets and air distribution within a glove room requires special consideration, so that spreading of the extremely fine powder applied to the gloves is confined as much as possible to that portion of the room where this powder is used. Avoid, where possible, a positive pressure, within this space; the power should not spread outside of the glove room into other areas.

Constant Temperature and/or Humidity Rooms

The laboratory section of a hospital will generally require constant temperature and/or humidity rooms. Maintaining constant temperatures and humidities throughout the year on a 24-hour basis requires a very elaborate and costly system which includes high and low temperature and humidity alarms and, in some instances, wet and dry bulb recorders. In recent years, a shop fabricated, field erected room has been placed on the market, and is designed to provide for such laboratory needs. The unit may be ordered in various sizes, complete with refrigeration, humidification, completely wired controls, alarms, recorders, interior lighting, shelving, insulated walls, and other specialties, as required. The installed packaged room is considerably less expensive than one that is completely field fabricated, and is apt to provide (1) more trouble-free operation and (2) to maintain required conditions within closer tolerances.

In addition to the areas previously described and recommended to be included in any basic, minimum air conditioning scheme for a hospital, serious consideration must also be given to each of the following areas:

1. Nurseries
2. Lower floors including clinics, pharmacy, coffee shop, cafeteria, general office area.
3. Laboratories
4. Morgue
5. X-Ray and radiology
6. Patient bed rooms
7. Animal Research Laboratory

Nurseries

Most hospitals do not require that nurseries be air conditioned. Air conditioning is always, however, seriously considered for such space during the planning stages of engineering design. Providing air conditioning for the nurseries alone, and then disregarding the associated corridors, mothers' bed rooms, and nurses stations is not considered good practice, since babies must be moved through unconditioned spaces having considerable differences in temperature and humidity. Since the initial cost of providing air conditioning for the nurseries, as well as the associated areas is frequently considered by the hospital to be excessive, the area, unfortunately, is usually not air conditioned.

One important function of the air conditioning system for any type of nursery is minimizing the spread of bacteria. Recent tests have indicated that one of the greatest sources of air-borne infection is bacteria carried on dust particles. The air conditioning system, with reasonably good ventilation and filtering, will (1) do much to prevent the spread of infection by enabling windows to remain closed throughout the year, and (2) will maintain a positive pressure and thus minimize dust accumulations within the spaces. It is impossible, however, to prevent dust borne bacteria from being carried from one place to another on the clothes and shoes of hospital personnel and visitors. Due to the lethal effect of humidity upon pathogenic organisms, control of humidity becomes another important function of the air conditioning system in limiting the spread of infection.

Recirculation of air from mothers' bed rooms and other areas to nurseries is frowned upon, despite the evidence that filtered, washed air is an excellent deterrent to air borne infection. It is, therefore, desirable that recirculation of air from spaces other than nurseries be avoided. Nursery air, recirculated within the nursery is acceptable, for normal nurseries. However, air from suspect nurseries must be discharged directly to the outer air.

Lower Floors

Areas such as clinics, pharmacy, coffee shop, cafeteria, and general office area are usually located on the lower floors where frequently the core area is the greatest. Such areas may require a considerable amount of ventilation and it is important to consider this cost when evaluating the initial cost of air conditioning for such spaces. The system may be designed for normal comfort conditions and air may be recirculated within the system. Air from areas such as the coffee shop and cafeteria have strong odors and of course, recirculation of such air must be avoided.

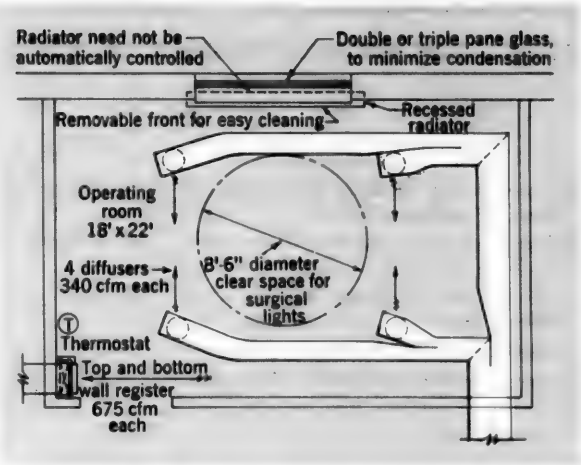

Radiator need not be automatically controlled
Double or triple pane glass, to minimize condensation
Removable front for easy cleaning
Recessed radiator
Operating room 18' x 22'
4 diffusers 340 cfm each
8'-6" diameter clear space for surgical lights
T
Thermostat
Top and bottom wall register 675 cfm each

Fig. 3. Air distribution for operating rooms.

Laboratories

A group of laboratory rooms will generally require an extensive fume hood exhaust system, and an equally extensive system of tempered air to make up for the quantities of air removed by the hoods. Designing a laboratory section of a hospital without such a tempered air supply for make-up air, must be avoided, since air would then infiltrate through windows and door ways carrying dust, soot and other contaminants, which would adversely affect the working conditions within these spaces. When a supply and exhaust system is justified for such an area, adding the required refrigeration capacity for air conditioning may not be too great an increment of initial cost and is therefore worthy of serious consideration.

Exhaust air from the fume hoods is corrosive and ductwork must therefore be constructed of acid-resistant materials such as No. 316 stainless steel or transite. There are several coated metals on the market which are considerably cheaper initially, and may be worthwhile for this application. Extreme care must be taken, however, when using coated metals, so that the coating is not disturbed during fabrication, handling and installation. Fans, dampers, automatic controls and anything else directly within the corrosive air stream must be constructed of acid resistant materials or painted with acid resistant paint. Fusible links for fire dampers may be wax coated for adequate protection against the corrosive effect of the fumes.

Recirculation of air from this entire area must be avoided to prevent any build-up of strong odors and to preclude the possibility of damage to the air handling equipment by the corrosive effect of the atmosphere in the laboratories. Spaces are generally designed for normal comfort conditions.

Morgue

The morgue, like the laboratory, requires that a

TABLE I—UNIT PRICES OF EQUIPMENT AND UNITS INSTALLED

Item	Price
Air conditioning, including refrigeration, air handling, piping and controls	$1200-1400 per ton
Refrigeration cycle, including tower, piping, insulation and controls	$350-450 per ton
Supply ductwork, including fans, dry filters, controls, branch piping and insulation	$1.50 per cfm.
Exhaust ductwork (galvanized iron)	$1 per cfm.
Exhaust ductwork (kitchen or fume hood exhaust)	$1.50 to $2 per cfm.
Direct radiation	$4 to $5 per sq ft of EDR
Cost of boilers, including controls and burners	$1.50 per pound of steam per hour
Cost of boiler plant, including breeching, feedwater pumps, fuel storage, controls, burners, and other associated equipment	$4.50 to $6 per pound of steam per hour.

considerable amount of air be exhausted to minimize the spread of odors. This area requires from 10 to 14 air changes per hour, and an exhaust air system which is capable of providing 24-hour service. Air recirculation from this space to others must be avoided.

X-Ray and Radiology

These areas are rarely included with any basic minimum air conditioning scheme for a hospital. Like many other areas, the cost of air conditioning the X-ray and radiology sections must be evaluated for the initial installation. If, for economy purposes, it is decided to exclude air conditioning for these areas, it is strongly recommended that provisions be made for expanding the facilities of the hospital to include this section at a future date.

An unusual problem arises in the design of a system for these rooms, which patients use for very short periods and in various stages of undress. Since the rooms are used sporadically, lighting as well as other heat loads fluctuate widely, making it desirable to include individual temperature control for each room.

Unless the room temperatures can be quickly and automatically adjusted to respond to the comfort requirements of the patient, these rooms will always present a problem to the building engineer, the man who must provide satisfactory conditions after the building is constructed and occupied.

With each of the various types of radiation machines that are used for X-ray photographs and therapy, a varying degree of radiation intensity is produced. Related to this intensity is the amount of shielding that will be required for the air conditioning and heating ductwork and piping in the X-ray and radiology areas. Therefore, it is not feasible to set up one basic standard to follow. The design engineer must consult with the architect and the hospital medical staff so that where shielding is necessary, adequate protection will be provided for the installation.

Patient Bed Rooms

Although the many advantages that air conditioning affords a patient is universally recognized, it is extremely rare that a hospital will air condition all of the patient rooms. Unfortunately, the acute need for the greatest number of hospital beds, with the least initial cost, is generally the governing factor in deciding whether or not these rooms are to be air conditioned. A common compromise for this situation is to provide electrical outlets in each room for window unit air conditioners, which patients pay for ultimately, by renting these units on a day-to-day basis.

When a decision has been made to provide air conditioning for all patient rooms, one type of system having many desirable features, is the induction type of window unit. These units are quiet, trouble-free, and can be selected for a wide variation of temperature control in the individual patient room. When one considers that this system also serves as the winter heating system, it is also comparatively economical to install these units initially. The central fan system should include a good filter and a sprayed coil dehumidifier arranged to control humidity both winter and summer.

Animal Research Laboratory

As a result of the extensive research carried on today in the fields of cancer and other diseases, as well as the use of animals for diagnostic purposes, more and more hospitals are including animal research laboratories in the basic scheme. It is a virtual necessity to provide adequate air conditioning for such an area so that constant temperature and humidity conditions may be maintained on a 24-hour basis, throughout the year. Laboratory animals are subjected to very elaborate and extensive tests, frequently lasting many months. Temperature and humidity conditions must be maintained at a fairly constant level so that variable room conditions will not be a factor to consider when analyzing the results of a test. Because of the great expense of conducting such tests, and the time consumed with these animals, the initial cost of providing air conditioning for these rooms is insignificant by comparison.

Animal rooms should be designed for approximately 78 deg F. dry bulb and 50% R.H., and must have a good ventilation rate of at least 10 to 14 air changes per hour. It is recommended that 100% fresh air be used for this system to keep odors within the animal rooms to a minimum. The entire research area should be kept at a negative pressure to avoid spreading strong odors throughout the hospital. Half of the exhaust air from the animal rooms should be taken at the ceiling, the remainder from a convenient place near the floor. Location of exhaust grilles directly behind cages must, of course, be avoided. Great care must be taken with locating the outside air discharge opening, to avoid the possibility of strong odors being blown through open hospital windows, or through fresh air intakes of other systems. These odors are rather offensive and difficult to dissipate.

The fan system may be similar to the system described for operating rooms except that high efficiency

TABLE 2—DESIGN CONDITIONS FOR AIR CONDITIONING

Area	Summer		Winter		Minimum Fresh Air	Type of Zoning
	Dry Bulb	% R.H.	Dry Bulb	% R.H.		
Operating rooms	74-78	55-60	76-78	55-60	8-12 air changes per hr, and no recirculation	Individual reheat required for each room
Surgical areas	76-78	55-60	74-76	50-55	0.3 cfm per sq ft	Normal exposure zoning required
Recovery	76-78	55-60	74-76	50-55	100% fresh air, no recirculation	Normal exposure zoning required
Delivery rooms	76-78	55-60	76-78	55-60	8 air changes per hr, and no recirculation	Individual reheat required for each room
Central sterile supply	78-80	No control	70-72	No control	Amount of fresh air governed by required exhaust	Requires reheat for temperature control of area
Animal rooms	75-80	45-55	75-80	20-30	10-14 air changes per hr and no recirculation	Individual reheat required for each room
Morgue	78-80	45-50	70-72	20-30	No recirculation	Normal exposure zoning required
Nurseries	76-82	55-65	76-82	55-65	0.3 cfm per sq ft	Requires reheat for temperature control for each area
General areas	78-80	45-50	70-72	20-30	0.3 cfm per sq ft	Normal exposure zoning required
Patient bed rooms	78-80	45-50	72-74	20-30	0.3 cfm per sq ft	Normal exposure zoning required
Laboratories	78-80	45-50	70-72	20-30	Amount of fresh air governed by hood exhaust	Normal exposure and equipment concentration will determine the extent of zoning required
X-ray and radiology	78-80	45-50	74-76	20-30	0.3 cfm per sq ft	Normal exposure zoning required. Consider temperature control for each room

filters may be omitted where initial cost is considered more important. Each animal room should have an individual reheat coil with the controlling thermostat located within the room where it will not interfere with the cages and where it will best sense the average temperature of the space. Controlling room temperature by means of volume dampers in supply ducts is not recommended, since this may seriously reduce the required ventilation and provide unsatisfactory results.

Basic Cost Estimates

A handy tool for the engineer during the planning stages of a hospital is a list of unit prices, to enable him to determine, roughly, how much a system will cost before spending valuable time and effort in preparing budget plans for closer estimates by a contractor. Unit prices will vary considerably with the locality, the length of duct and pipe runs, and the size, type and quality of the system designed. The engineer must, therefore, utilize judiciously the cost units that are listed in Table 1.

Types of Refrigeration Systems

Direct Expansion. The use of direct expansion systems for comfort air conditioning in hospitals is generally restricted for technical reasons and frequently by local codes. Adequate control of relative humidity, where required, becomes a difficult problem with which to cope. Furthermore, air conditioning systems are generally scattered in many locations within a hospital, making it objectionable to circulate a refrigerant of the freon-type or something similar, through an extensive piping system, with its possibilities for leakage. Although less expensive initially, direct expansion systems are not commonly used in hospitals for comfort air conditioning, because of these objections.

Chilled Water. A circulated chilled water system is highly suitable for easy distribution to remote sections of the hospital, and for controlling space temperatures and humidity. Its somewhat greater initial cost does not prevent the chilled water system from being the most commonly used central system for a hospital.

Air Handling Systems for Air Conditioning

Central Low Pressure System, Field Erected. This system is highly suitable for large installations requiring more than approximately 15,000 cu ft of air per minute. A field erected system can be made to fit within an allotted space. Accessibility to all parts

TABLE 3—DESIGN CONDITIONS FOR VENTILATION

Area	Cfm per Sq Ft	Type of Ventilation	Remarks
Kitchen	4-6	Filtered supply and exhaust	Exhaust quantity is determined by required hood exhaust
Dining rooms	2-3	Filtered supply and exhaust through kitchen, where feasible	
Boiler room	3-5	Exhaust (consider the economy of a filtered supply)	When occupied spaces are located above the boiler room, consider a ventilated hung ceiling in boiler room
Public toilets	2.5-3	Exhaust	
Private toilets	2-3	Exhaust	Private toilets with windows will not require any ventilation
Locker rooms	1.5-2	Supply and exhaust	Where feasible, exhaust through openings to adjacent toilets
Slop sinks	2-3	Exhaust	
Serving pantry	1.5-2	Exhaust	
Utility rooms	2-3	Exhaust	
Dark rooms	1-1.5	Exhaust	
General areas	1-1.5	Supply and exhaust	

Notes:
1. Provide make up air in corridors and other areas to maintain a slightly positive pressure in the building.
2. Areas having strong odors or requiring isolation must be kept under a slightly negative pressure.

of this system for ease of maintenance is probably one of the most important advantages this type of system offers.

Central Low Pressure System, Packaged Air Handling Unit. This system is suitable for small systems of less than approximately 15,000 cu ft of air per minute. A packaged unit is generally less expensive and quite compact, requiring less space than a field erected system. When numerous small systems are required to be located within a confined space, which is frequently the situation in hospitals, the packaged unit is suitable. Before specifying, or approving painted interior surfaces for systems serving critical areas, the possibility of paint peeling or flaking should be considered. It is considerably safer to specify galvanized iron or some other type of noncorrosive metal for the packaged unit. There is poor accessibility in this unit for internal maintenance of coils, casings, fan housings, eliminators and dampers.

Central High Pressure Perimeter System

When a hospital is provided with 100% air conditioning including patient bed rooms, the perimeter type induction system has definite advantages. Each room may be individually controlled to suit the comfort of the patient, during both summer and winter seasons. The small amount of primary air required in each bed room is just about enough to make up for the air exhausted through toilets, thus minimizing, and under certain circumstances, virtually eliminating the need for a return air system. The capacity requirements of such a system will generally be sufficiently large to justify a field erected air handling system. A condensate drain system from each of the window units is mandatory in a hospital, because of the high humidity maintained in many areas.

Window Units. These units are frequently used in patient bed rooms on a rental basis when central air conditioning is unavailable. They are also used in the administrative portions of a hospital, when necessary. Because window units require frequent replacement, provide very little ventilation, are difficult to service and are noisy, they are not recommended for air conditioning entire sections of a hospital.

Fan-Coil Units. These units, when selected for quietness, afford many of the advantages listed for the induction type perimeter unit. They do, however, require a somewhat greater amount of maintenance.

Double Duct System. When a wide range of flexibility in room conditions is required, the double duct system is quite suitable. This system, however, frequently requires a greater amount of ductwork and larger shafts and fan rooms than other types of systems. It also tends to be more costly.

Basic Design Conditions

Tables 2 and 3 may be used as a basis for initial design,* and for estimating the capacities required when preparing a budget estimate. Specific requirements for the hospital, when carefully evaluated, will of course dictate the actual design conditions to be used.

FLOW OF WATER IN CIRCULAR SEWERS

Continued from May. Table by J. Nachbar, associate, Albert Kahn Associated Architects and Engineers, Detroit, Mich.

Pipe ID, Inches	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID, Inches
	.0048		.0050		.0055		.0060		
	V = Mean Flow Velocity, Ft per Sec, Q = Flow Capacity, Cu Ft per Sec								
	V	Q	V	Q	V	Q	V	Q	
4	1.25	.11	1.28	.11	1.34	.12	1.40	.12	4
5	1.50	.21	1.53	.21	1.61	.22	1.68	.23	5
6	1.74	.34	1.78	.35	1.87	.37	1.95	.38	6
8	2.2	.77	2.2	.78	2.3	.82	2.4	.86	8
10	2.6	1.42	2.7	1.45	2.8	1.53	2.9	1.59	10
12	3.0	2.4	3.1	2.4	3.2	2.5	3.3	2.6	12
15	3.5	4.3	3.6	4.4	3.8	4.7	4.0	4.9	15
18	4.1	7.2	4.1	7.3	4.3	7.7	4.5	8.0	18
21	4.5	10.9	4.6	11.2	4.9	11.7	5.1	12.2	21
24	5.0	15.7	5.1	16.1	5.4	16.8	5.6	17.6	24
27	5.4	21.7	5.6	22.1	5.8	23.2	6.1	24.2	27
30	5.9	28.8	6.0	29.4	6.3	30.8	6.6	32.2	30
36	6.7	47.1	6.8	48.1	7.1	50	7.5	53	36
42	7.4	71	7.6	73	7.9	76	8.3	80	42
48	8.1	102	8.3	104	8.7	109	9.1	114	48
54	8.8	140	9.0	143	9.4	150	9.8	156	54
60	9.4	185	9.6	189	10.1	198	10.5	207	60
66	10.0	239	10.2	244	10.8	256	11.2	267	66
72	10.6	301	10.9	307	11.4	322	11.9	336	72
78	11.2	372	11.4	380	12.0	398	12.5	416	78
84	11.8	453	12.0	462	12.6	485	13.1	506	84
90	12.3	543	12.5	554	13.2	581	13.8	607	90
96	12.8	644	13.1	657	13.7	690	14.3	720	96

Pipe ID	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID
	.0065		.0070		.0075		.0080		
	V	Q	V	Q	V	Q	V	Q	
4	1.46	.13	1.51	.13	1.57	.14	1.62	.14	4
5	1.75	.24	1.82	.25	1.88	.26	1.94	.27	5
6	2.0	.40	2.1	.41	2.2	.43	2.2	.44	6
8	2.5	.89	2.6	.93	2.7	.96	2.8	.99	8
10	3.0	1.66	3.1	1.72	3.3	1.78	3.4	1.84	10
12	3.5	2.7	3.6	2.8	3.7	2.9	3.9	3.0	12
15	4.1	5.1	4.3	5.3	4.4	5.4	4.6	5.6	15
18	4.7	8.4	4.9	8.7	5.1	9.0	5.2	9.3	18
21	5.3	12.7	5.5	13.2	5.7	13.7	5.9	14.1	21
24	5.8	18.3	6.0	19.0	6.3	19.7	6.5	20.3	24
27	6.3	25.2	6.6	26.2	6.8	27.1	7.0	28.0	27
30	6.8	33.5	7.1	34.8	7.3	36.0	7.6	37.2	30
36	7.8	55	8.1	57	8.3	59	8.6	61	36
42	8.6	83	9.0	86	9.3	89	9.6	92	42
48	9.4	119	9.8	123	10.2	128	10.5	132	48
54	10.2	163	10.6	169	11.0	175	11.4	181	54
60	11.0	216	11.4	224	11.8	232	12.2	229	60
66	11.7	278	12.1	288	12.6	298	13.0	308	66
72	12.4	350	12.8	363	13.3	376	13.7	388	72
78	13.0	433	13.6	449	14.0	465	14.5	480	78
84	13.7	527	14.2	547	14.7	566	15.2	584	84
90	14.3	632	14.8	656	15.4	679	15.9	701	90
96	14.9	750	15.5	778	16.0	805	16.5	832	96

FLOW OF WATER IN CIRCULAR SEWERS

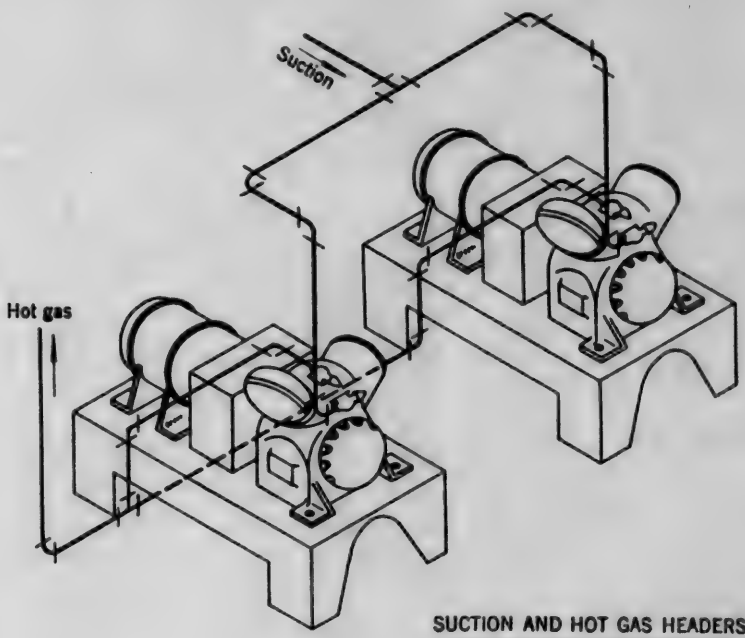
Pipe ID, Inches	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID, Inches
	.0085		.0090		.0095		.010		
	V = Mean Flow Velocity, Ft per Sec, Q = Flow Capacity, Cu Ft per Sec								
	V	Q	V	Q	V	Q	V	Q	
4	1.67	.15	1.72	.15	1.77	.15	1.81	.16	4
5	2.0	.27	2.1	.28	2.1	.29	2.2	.30	5
6	2.3	.46	2.4	.47	2.5	.48	2.5	.50	6
8	2.9	1.02	3.0	1.05	3.1	1.08	3.2	1.11	8
10	3.5	1.90	3.6	1.95	3.7	2.0	3.8	2.1	10
12	4.0	3.1	4.1	3.2	4.2	3.3	4.3	3.4	12
15	4.7	5.8	4.9	6.0	5.0	6.1	5.1	6.3	15
18	5.4	9.6	5.6	9.8	5.7	10.1	5.9	10.4	18
21	6.1	14.6	6.2	15.0	6.4	15.4	6.6	15.8	21
24	6.7	21.0	6.9	21.6	7.0	22.1	7.2	22.7	24
27	7.3	28.8	7.5	29.7	7.7	30.5	7.9	31.3	27
30	7.8	38.4	8.0	39.5	8.3	40.6	8.5	41.6	30
36	8.9	63	9.1	65	9.4	66	9.6	68	36
42	9.9	95	10.2	98	10.4	100	10.7	103	42
48	10.8	136	11.1	140	11.4	144	11.7	147	48
54	11.7	186	12.0	192	12.4	197	12.7	202	54
60	12.6	247	12.9	254	13.3	261	13.6	267	60
66	13.4	318	13.8	327	14.1	336	14.5	345	66
72	14.2	400	14.6	412	15.0	423	15.4	434	72
78	14.9	495	15.3	509	15.8	523	16.2	537	78
84	15.6	602	16.1	620	16.5	637	17.0	653	84
90	16.4	723	16.8	744	17.3	764	17.8	784	90
96	17.1	857	17.5	882	18.0	906	18.5	930	96

Pipe ID	Slope of the Hydraulic Grade Line, Ft per Ft								Pipe ID
	.011		.012		.013		.014		
	V	Q	V	Q	V	Q	V	Q	
4	1.90	.17	1.99	.17	2.1	.18	2.1	.19	4
5	2.3	.31	2.4	.33	2.5	.34	2.6	.35	5
6	2.6	.52	2.8	.54	2.9	.57	3.0	.59	6
8	3.3	1.16	3.5	1.21	3.6	1.26	3.7	1.31	8
10	4.0	2.2	4.1	2.2	4.3	2.3	4.5	2.4	10
12	4.5	3.6	4.7	3.7	4.9	3.9	5.1	4.0	12
15	5.4	6.6	5.6	6.9	5.8	7.2	6.1	7.4	15
18	6.2	10.9	6.4	11.4	6.7	11.8	6.9	12.3	18
21	6.9	16.6	7.2	17.3	7.5	18.0	7.8	18.7	21
24	7.6	23.8	7.9	24.9	8.2	25.9	8.6	26.9	24
27	8.3	32.8	8.6	34.3	9.0	35.7	9.3	37.0	27
30	8.9	43.7	9.3	45.6	9.7	47.5	10.0	49.3	30
36	10.1	71	10.6	75	11.0	78	11.4	81	36
42	11.2	108	11.7	113	12.2	118	12.7	122	42
48	12.3	155	12.8	162	13.4	168	13.9	174	48
54	13.3	212	13.9	221	14.5	230	15.0	239	54
60	14.3	281	14.9	293	15.5	305	16.1	317	60
66	15.2	362	15.9	378	16.5	393	17.2	408	66
72	16.1	456	16.8	476	17.5	495	18.2	514	72
78	17.0	563	17.7	588	18.5	612	19.1	636	78
84	17.8	685	18.6	716	19.4	745	20.1	773	84
90	18.6	823	19.4	859	20.2	894	—	—	90
96	19.4	975	20.3	1019	—	—	—	—	96

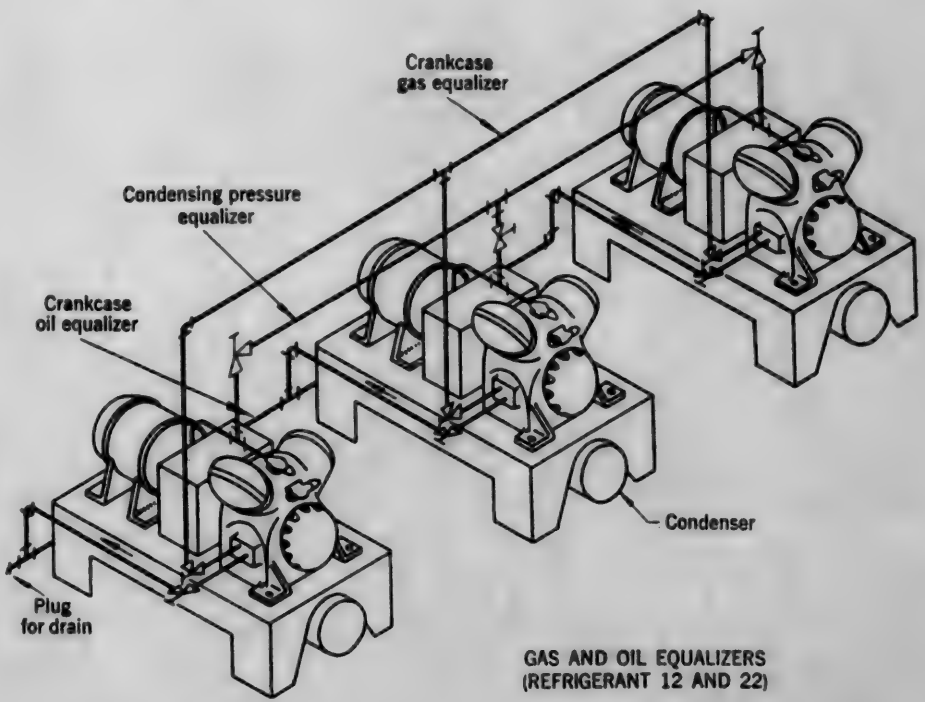
(The table is continued next month.)

REFRIGERANT PIPING

Hookups for Multiple Compressors



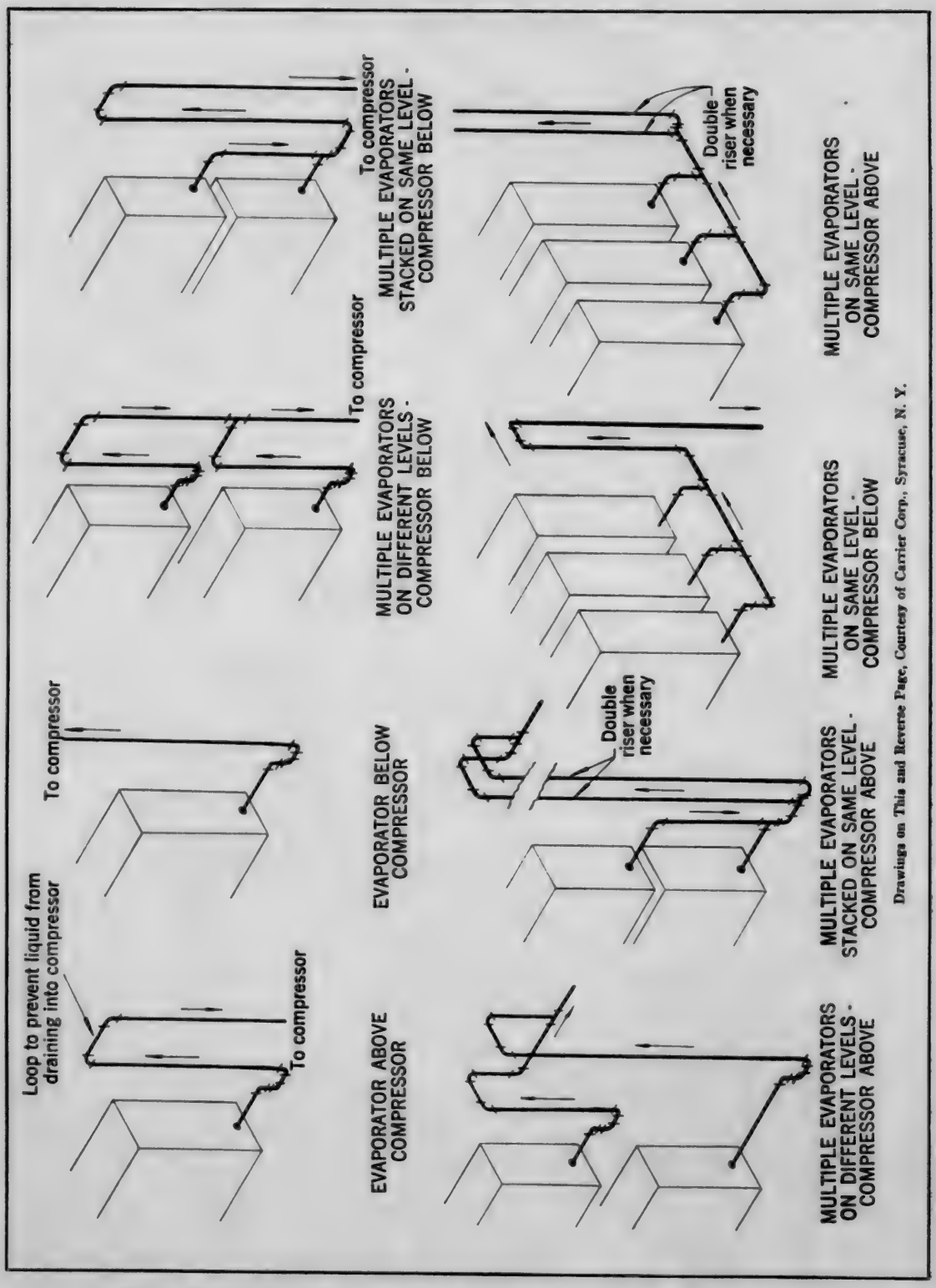
SUCTION AND HOT GAS HEADERS
FOR MULTIPLE COMPRESSORS



GAS AND OIL EQUALIZERS
(REFRIGERANT 12 AND 22)

REFRIGERANT PIPING

Hookups for Evaporator Installations


Loop to prevent liquid from draining into compressor
To compressor
To compressor
EVAPORATOR ABOVE COMPRESSOR
To compressor
EVAPORATOR BELOW COMPRESSOR
To compressor
MULTIPLE EVAPORATORS ON DIFFERENT LEVELS - COMPRESSOR BELOW
To compressor
MULTIPLE EVAPORATORS STACKED ON SAME LEVEL - COMPRESSOR BELOW
Double riser when necessary
MULTIPLE EVAPORATORS ON DIFFERENT LEVELS - COMPRESSOR ABOVE
Double riser when necessary
MULTIPLE EVAPORATORS STACKED ON SAME LEVEL - COMPRESSOR ABOVE
MULTIPLE EVAPORATORS ON SAME LEVEL - COMPRESSOR ABOVE
Drawings on This and Reverse Page, Courtesy of Carrier Corp., Syracuse, N. Y.

DETAIL SHEET—AIR CONDITIONING, HEATING AND VENTILATING

June, 1960

Distilleries Use Liquor Chilling

C. S. CAVE
Product Manager, Airtemp Division, Chrysler Corp.
Dayton, Ohio

Some bourbon type liquor becomes cloudy when its temperature is lowered. Liquor chilling is used to assure a clear fluid before the bottling operation. This article presents engineering computations for sizing the chilling unit and also a typical specification.

BATCH chilling of spiritous liquors is a relatively new application for mechanical refrigeration. This use is a preventive measure to insure against cloudiness of the liquor after bottling.

A filterable suspension is formed in some bourbon type liquors when the temperature of the liquor is lowered below 30 deg F. This suspension, while not affecting the taste of the liquor, detracts from appearance and salability in retail stores. Low ambient temperatures are quite often encountered during transportation and warehouse storage of the bottled product. Therefore, a plan was instituted to force the suspension to form and to filter it out at the distillery before bottling the liquor.

Direct expansion liquor chilling, Fig. 1, has found favor in these applications and most distilleries prefer a packaged unit complete with direct expansion cooler, compressor, condenser, control panel and starter.

Typical Specification

A typical specification (in part) as issued by one distillery, is as follows:

1. Manufacturer shall furnish one (1) packaged liquid chiller. Unit shall have a refrigeration capacity of 396 tons not to exceed 6 hours batch time when cooling 9,000 gal of whiskey of 86 to 90 proof from 80 deg to 14 deg when supplied with 3 gpm per ton of 85 deg condensing water maintaining 105 deg condensing temperature. Pressure drop shall not exceed 14 psi through the chiller and 6.5 psi through the condenser.

2. The unit shall be complete with compressor, condenser, insulated direct expansion chiller, heat exchangers having liquid refrigerant in the shell and refrigerant vapor in the tubes, pressure control utilizing manual reset for high pressure cut out and oil failure safety control, thermostatic expansion valves with thermal bulbs installed in thermal wells, liquid line solenoid valves, freeze protection thermostat set for −10 deg, pressure relief valve, charging valve, liquid indicators, liquid line strainers before each solenoid valve and all interconnecting refrigerant piping. Units shall be shipped with a holding charge, and separate operating charge of Refrigerant-22 and a complete operating charge of compressor oil. A

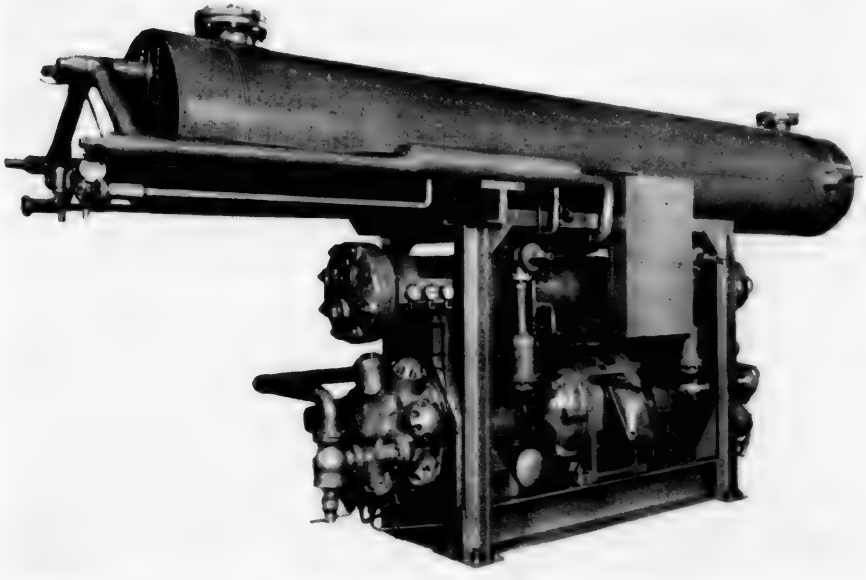


Fig. 1. Typical packaged liquor chiller. Courtesy, Chrysler Airtemp.

C. S. Cave, a native of Dallas, Tex., attended Southern Methodist University, Cornell University and the University of Texas. For 12 years he was with various sales and construction divisions of Airtemp and for the next nine years was chief engineer of Airtemp Construction Corp., Dayton, Ohio. From 1958 on he has been product manager of Applied Machinery & Systems Department, Airtemp Division, Chrysler Corp. Since 1945 he has been a member of the faculty of Sinclair College, Dayton, Ohio. A member of ASHRAE, he is on its Industrial Environment Committee, and is also a member of Reciprocating Compressor and Condensing Unit Section of ARI. He has written a number of articles on air conditioning and refrigeration.

refrigerant dryer of adequate size shall be included and installed. The unit shall include an automatic built-in compressor capacity reduction mechanism with a minimum of 5 steps of capacity reduction to provide a balance between compressor capacity and evaporator load requirements and with reduced motor brake horsepower at partial loads. Other items covered in the specifications include: Control panel, starter, vibration isolators and water regulating valve.

Use of Passivating Solution

Of particular interest is the construction of the chiller. The shell, tube sheet and tubes were constructed of type 304 stainless steel, with all stainless steel parts being passivated after fabrication. The passivation of the stainless steel is required to dissipate any free iron which might be present on the surface of the stainless steel and also to form a protective coating on the surface. This step is required to prevent taste contamination of the liquor.

The passivating solution was specified to have the following composition:

Nitric acid (38 deg Baume), 10 parts by volume
Hydrofluoric acid, 2 parts by volume
Water added to make 100 parts by volume

The passivating solution is applied to the surfaces to be treated for a period of not less than 20 minutes. The surfaces are then rinsed with warm distilled water followed by a 2% (by volume) solution of ammonia. This is followed by a free iron test consisting of the application of a solution of 3% nitric acid and 5% potassium ferricyanide. Free iron causes a blue color to appear. All piping, valves and storage tanks are stainless steel and are treated similarly.

Equipment Selection

The selection of equipment for a batch chilling job such as for this application presents more problems than equipment selection for fixed load conditions, such as for most process work and air conditioning. Factors which must be considered are the following:

1. The refrigeration load is continually diminishing. In this particular job, described in the specifications, the equipment is balanced at approximately 130 tons at the start, and is finished off at about a 46-ton rate. This constantly diminishing tonnage is caused by the ever decreasing evaporator temperature which follows the batch temperature down. Figure 2 shows the average batch (tank) temperature and evaporator temperature plotted against time.

Since all components, including the shell and tube condenser, cooling tower and expansion valves, are selected for the maximum load, it is evident that these become oversize as the pull down progresses. This becomes an advantage as far as compressor capacity is concerned, because the compressor ratio at lower evaporator temperatures becomes more favorable, if the condensing temperature is allowed to drop due to rebalance at lower tonnages. This may pose thermostatic

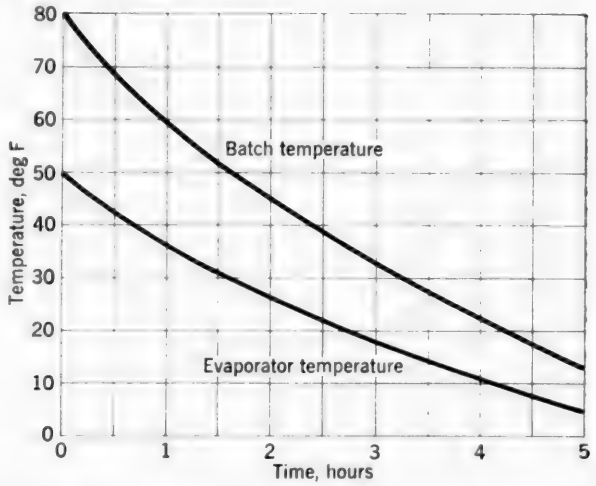


Fig. 2. Average batch and evaporator temperature plotted against time.

"A filterable suspension is formed in some bourbon type liquors when the temperature of the liquor is lowered below 30 deg. F. This suspension, while not affecting the taste of the liquor, detracts from appearance and salability in retail stores. Low ambient temperatures are quite often encountered during transportation and warehouse storage of the bottled product. Therefore, a plan was instituted to force the suspension to form and to filter it out at the distillery before bottling the liquor. The selection of equipment for a batch chilling job such as for this application presents more problems than equipment selection for fixed load conditions, such as for most process work and air conditioning."

expansion valve or oil return problems. Pilot operated expansion valves and gravity oil drain to the compressor, were employed in this particular case.

2. Since this application is one in which refrigeration would be required the year-around, provision must be made for winter operation of the cooling tower or evaporative condenser in below freezing weather.

3. Complete batch chilling elapsed time, including filling of tanks from barrels, is usually limited by the distillery to an eight-hour (or shorter) period to prevent the necessity of overtime or second shift personnel.

Basis of Calculations

1. Heat load is calculated for a 36-minute cycle. The complete cycle period is determined as follows:

$$\frac{\text{9000 gal liquor}}{\text{250 gal per minute}} = \text{36 minutes}$$

2. Chiller is required to handle the rated compressor load during the five-hour chilling cycle. Compressor load is less than or equals the chiller load.

Typical Cycle Calculation

1. The cycle calculations are trial and error, based on an assumed evaporator temperature to determine compressor rating.
2. Batch exit temperature at end of each cycle is determined.
3. M.T.D. (mean temperature difference) and overall U of chiller is determined. See Fig. 3.
4. Calculate chiller load and compare compressor load vs. chiller load.
5. Repeat sequence until batch exit temperature is below 14 deg.
6. Calculate total chilling time required, and heat removed by compressor during chilling operation.

First Cycle Calculation

1. Assume 50 deg evaporator temperature.
2. Compressor load = 129.7 tons × 12,000 Btu per hr = 1,556,000 Btu per hr.
3. Compressor load per cycle = 1,556,000 Btu per hr $\times \frac{\text{36 min per cycle}}{\text{60 min}}$ = 931,753 Btu per cycle.
4. Batch temperature drop = $\frac{\text{Btu per cycle}}{\text{gal liquor} \times \text{weight per gal} \times \text{specific heat}}$

$$= \frac{931{,}753}{9000 \times 7.83 \times 0.925} = 14.3 \text{ deg.}$$

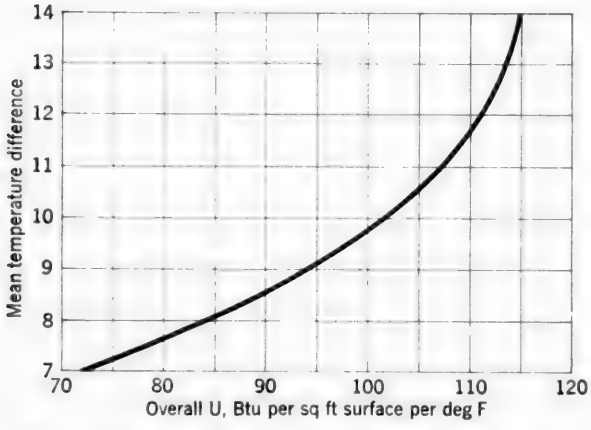


Fig. 3. Overall U factor for whiskey chiller, plotted against mean temperature difference.

TABLE I—CYCLE CALCULATION

Cycle	Heat Removed Btu per Cycle	Time in Minutes
1	931,753	36
2	833,013	36
3	677,270	36
4	563,618	36
5	488,000	36
6	417,624	36
7	358,081	36
8	324,133	36
Total	4,593,492	288

5. Batch exit temperature = temperature at start of cycle minus batch temperature drop during the cycle. 80 deg — 14.3 deg = 65.7 deg batch exit temperature.
6. First cycle chiller MTD

80 deg	65.7 deg
50 deg	50 deg
30 deg Greater temp. diff.	15.7 deg Least temp. diff.

$\therefore$ MTD = 22 deg

7. For MTD of 22, use U of 115—from Fig. 3.
8. Chiller load per hour = U × A × MTD = 115 × 866 × 22 = 2,190,000 Btu per hr.

   A = 866 = square feet of transfer surface in the chiller. The size of the chiller (therefore the square feet of surface) was arrived at first by inspection, as was the selection of the compressor.

   Chiller load per cycle = 2,190,000 Btu $\frac{36}{60}$ = 1,315,000 Btu per cycle.
9. Compressor load Btu per cycle $\leqq$ chiller load Btu per cycle

   931,753 Btu $<$ 1,315,000

   Therefore chiller will remove 931,753 Btu in first 36 minutes of operation.

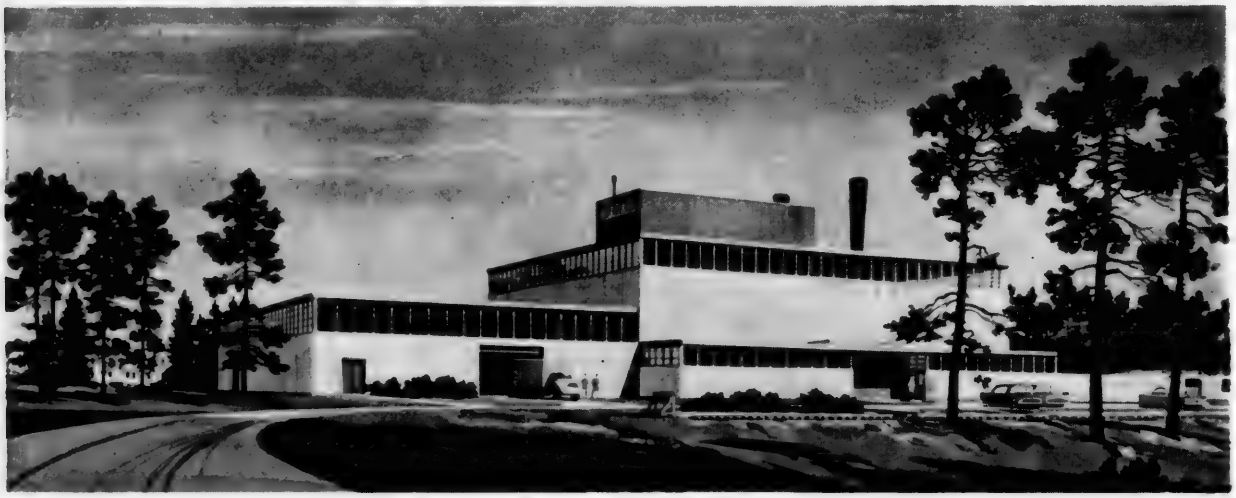
Repetition of cycle calculations will provide the data listed in Table 1.

It is interesting to note that while automatic capacity reduction was specified and furnished on the compressor, these devices were locked out and full pumping capacity of the compressor utilized.

The following properties of liquor were used to calculate the loads:

Specific heat = 0.925 Btu per lb per deg

Specific gravity = 0.94 or 7.83 lb per gal.



Turbo-Generators Supply Steam For High Temperature Water Heating

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IN November of 1958 operation was started in the initial, so-called "ghost" increment of a central heat and power plant for Ernest Harmon Air Force Base, Stephenville, Newfoundland. When expanded by the next increment, this plant will be the first in the Western Hemisphere to generate high temperature water (HTW) for district heating by utilizing extraction steam from turbine generator units.

Figure 1 illustrates the initial design concept. Steam from any of four boilers is supplied to the turbine header and reducing valve station at 450 psig and 600 deg F.

Under maximum rated conditions, approximately 105,000 lb per hr of steam can be extracted from each turbine at 150 psig for heating, with a minimum of approximately 5000 lb per hr passing through the lower pressure stages and expanding further to subatmospheric pressure and discharging to a condenser.

Extracted steam is delivered at 150 psig to two direct contact HTW heaters (cascades) and to two deaerators sitting on top of a horizontal storage tank. A pressure reducing station which by-passes the turbines supplements or replaces extraction steam with steam from the boilers when more heat is required than corresponds to the required electrical output of the generators. The condensate from the condenser and any required make-up are pumped to the two deaerators and are heated by extracted steam.

Return water from the HTW distribution system is delivered to the cascade heaters and heated in direct contact with 150-psig steam to its saturation temperature of 365 deg F. (Thus, the desired temperature of the water in the heating system dictated the pressure at which steam is extracted from the turbines.)

The horizontal storage tank is maintained at a pressure of 150 psig by the steam, and the heated water and condensed steam from the cascade heaters and deaerators flow into it by gravity. The heating system pumps circulate HTW from the tank through the distribution system and back to the cascade heaters to repeat the cycle. The boiler feed pumps also take suction from the tank, completing that cycle via boilers, turbines, and/or pressure reducing station. The tank, therefore, serves the dual purpose of a heating system expansion vessel and a boiler feed reservoir.

At design heating requirements, with 600-deg, 450-psig steam supplied to the turbines and 150-deg steam extracted from them, the steam quantities mentioned previously will provide for production of 4000 kw of electricity by the generators and transfer of 200 million Btu per hr of thermal energy by the cascade heaters.

Regeneration Principle Increases Efficiency

When heating requirements are reduced, less steam need be extracted at 150 psig, more of the steam will go through to the low pressure stage of the turbines and to the condensers. Hence, more work per pound of steam is extracted by the turbines and they will use a smaller quantity of steam.

In heating the condensed steam to 365 deg in the deaerators, the efficiency of the turbine heat-power

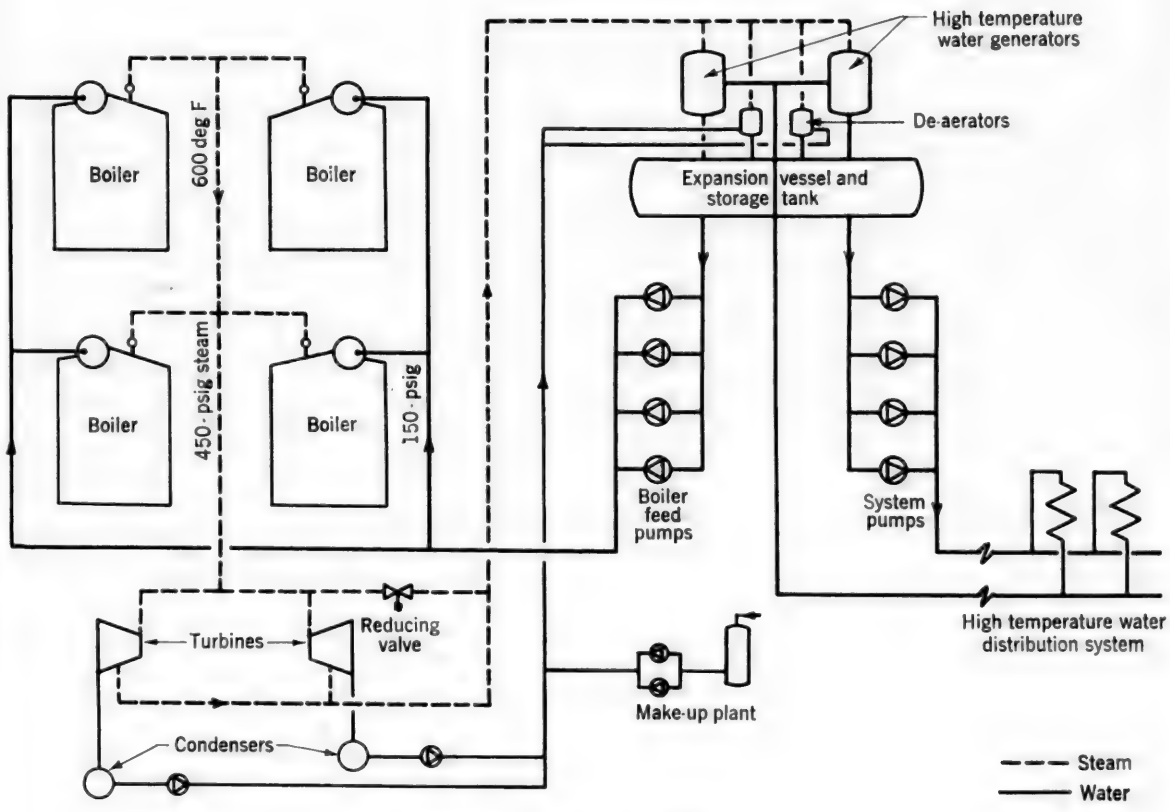


FIG. 1 COMBINED HEAT AND POWER PLANT

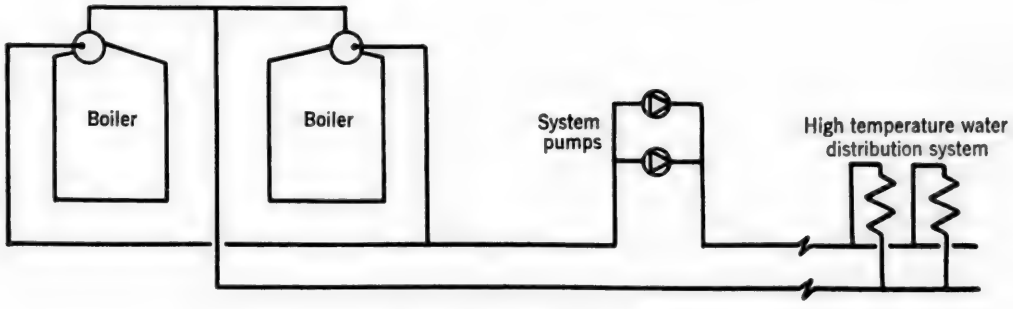


FIG. 2 "GHOST" INCREMENT

cycle is increased, a practice used in the heat power field based on the regenerative principle. (Readers of AIR CONDITIONING, HEATING AND VENTILATING are, perhaps, more familiar with a practice in the refrigerating field somewhat akin to this, where the Carnot cooling cycle is improved by sub-cooling hot liquid refrigerant from the compressor by heat transfer to cool gases from the evaporator.—Editor.)

Boilers, of the two-drum, bent-tube construction type, each generate super-heated steam at 450 psig and 600 deg with a nominal capacity of 60,000 lb per hr. However, due to intentionally conservative design criteria used for remote military bases, there is ample capacity in the heating surface, combustion air, boiler controls, oil burning equipment, and safety valves to continuously generate 75,000 lb per hr without exceeding capacities guaranteed by the boiler manufacturer (Wickes Boiler Co.).

Ghost Plant Increment

The initial design concept allows for two-turbine operation and full heating load with one of the four boilers down for maintenance. Sufficient space was provided for eventual future expansion of plant capacity to four turbine generators and six boilers. However, budget limitations restricted the initial construction to the "ghost plant" increment which is presently operating with a connected heating load of only 18,000,000 Btu per hr, serving two six-story dormitories, one mess hall, and a dental clinic.

This stripped-down version is shown in Fig. 2, and comprises two boilers, two HTW circulating pumps, and the make-up plant. The expansion tank, with its HTW generators and deaerators, was omitted, and boilers are operated directly as HTW generators at 150 psig and 365 deg. To accomplish this operation, special baffles and nozzles were designed in consultation with the boiler manufacturer and installed in the top drum. The HTW pumps take suction from the top drum and return the water to the same drum. During the "ghost plant" operation the upper drum serves as an expansion tank with steam available from the top of the drum for burner atomization and soot blowing. Superheater tubes, furnished with the boilers, are not installed.

Bids have now been received for the first expansion of the plant which includes an additional boiler, one 2000-kw turbine generator, the expansion tank with its HTW generators (cascades) and deaerators, and minor auxiliary equipment. In addition, the possibility exists that the HTW distribution system may be expanded to connect to additional buildings, making a potential heat load of approximately 100,000,000 Btu per hr.

Upon completion of this current increment, the turbine generators will be paralleled with the existing diesel power plant, consisting of diesel generator units from 300 to 1700 kw each. Condenser water will be available from Warm Creek, which runs adjacent to the plant and is fed by the overflow of Noel's Pond. When the ultimate plant size is reached, the elevation of Noel's Pond can be easily controlled to insure adequate condenser water during any prolonged dry season.

Make-up water presently is pumped directly from the make-up plant to the drums. A recorder for each boiler activates the pumps to supply water when the drum level falls below a predetermined mark. In the future, these recorders will control feed-water valves at the drums to regulate feed water from the expansion vessel. In addition, at that time, three-pen recorders which now record only flue-gas temperature will be connected to record steam flow as well. Make-up water will then be controlled by both water level and steam flow. The third pens of the recorders will record steam temperatures. In the final arrangement, the water level in the expansion vessel will control the make-up pump to supply the expansion vessel as it is depleted.

The drum-level recorder presently also operates at high level to admit cold water to the overflow pipe and to open the overflow valve and discharge water to the blow-off tank.

Continuous Blowdown Cuts Acidity

Continuous blowdown from the boilers into the expansion vessel of the HTW system is provided in the design for the future system. This will avoid loss of water and its heat content, while at the same time decreasing any tendency toward build-up of corrosive acidity in the otherwise salt-starved HTW system.

Combustion Controls

Each boiler has a control panel including: (1) Multipointer draft gage which indicates in inches of water, wind-box, furnace and uptake drafts; (2) Ratio-relay adjuster which positions the induced draft fan inlet damper to govern the flow of air in direct proportion to the flow of fuel oil; (3) Flue-gas temperature recorder; (4) Recorder for indicating and recording flow of oil and air; (5) Drum-level indicator and recorder; (6) Drum-pressure gage; (7) Boiler-feed pressure gage; (8) Push buttons for induced- and forced-draft fan motors; and (9) Space for future superheater outlet pressure gage.

A master panel includes: (1) A feedwater meter which records, indicates and integrates the total feedwater to the boilers. (Present charts are graduated for a flow of 15,000 lb water per hr; future equipment will provide for a flow of 300,000 lb per hr.) (2) Instrument air-pressure gages. (3) Fuel-oil header gage. (4) Push button stations for fuel pump and air compressor. (5) Instrument air pressure alarm. (6) Provisions for future indicating lights and push buttons and for 150 psig and 475 psig pressure gages and condensate return recorder for turbine operation. Combustion control equipment was furnished by Bailey Meter Co.

Grade 3 Arctic Pour Diesel is the fuel, selected because it is free flowing at —60 deg and requires no

pre-heating. One 50,000-gal storage tank is now installed and connections have been provided at the filling and suction manifolds for a future tank.

Oil burners, of the steam atomizing, wide-range type, with 8:1 turndown ratio, are installed with forced draft and registers. A mechanical atomizing nozzle has been provided for cold start-up and the atomizing steam pipework has been interconnected between both boilers to allow one boiler to provide steam when starting the other.

At the present time, chemicals may be fed into the make-up water as it is piped to the steam drums. However, connections have been made at the boiler drums so that chemicals may be injected directly into the drums in the future.

HTW is circulated through a completely closed piping circuit; supply and return mains generally run side by side. The main valves isolating the distribution network from the heating plant are motorized to enable the operator to initiate the closing of the valves and attend to other operations in the event of an emergency.

The heating system presently has two Byron Jackson circulating pumps installed with temporary motors running at 1750 rpm and reduced capacity impellers. Only one is required for the present load; the other serves as a stand-by. When the future load is imposed, the pump capacity will be increased by installing larger motors running at 3550 rpm and original impellers. There ultimately will be four pumps.

The Eastern Ocean District of the Corps of Engineers, U. S. Army, was the responsible agency for design and construction and Frank Grad & Sons. Newark, N. J., were the architects. The overall scheme and the "ghost plant" increments depicted in Fig. 1 and 2 were conceived and designed by J. O. Ross Engineering Division of the Midland-Ross Corporation, New York, N. Y.

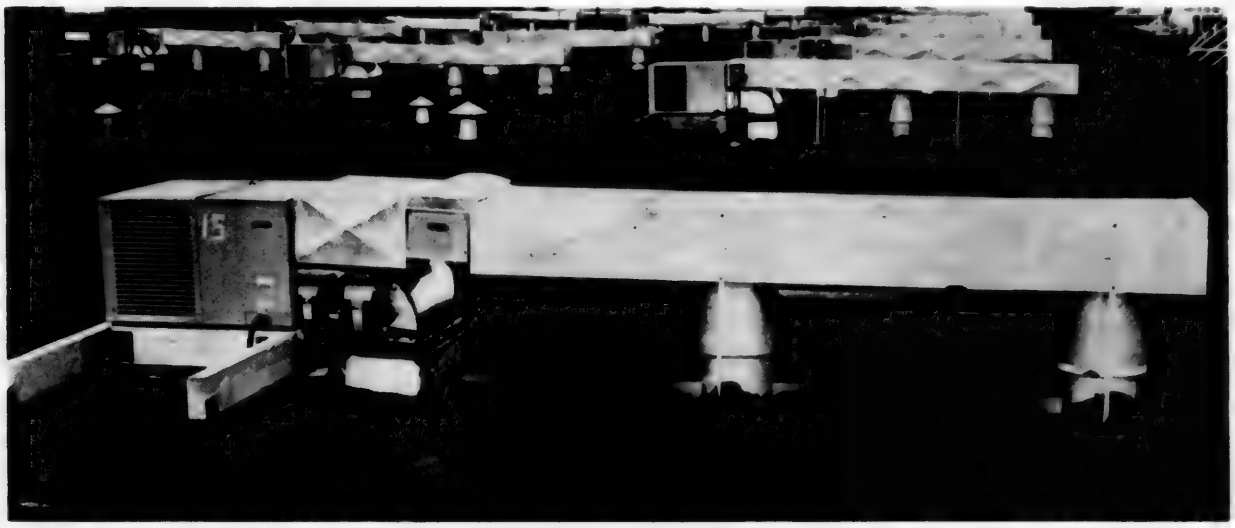
Heat Pumps Climate Condition New Shopping Center

The newest and largest shopping center in the Pacific Northwest is climate conditioned by a battery of roof-mounted heat pumps.

Each heat pump services one "comfort zone," which contains two 14-inch adjustable ceiling diffusers and one 16 by 20-inch ceiling return grille. The two round supply ducts and one rectangular return duct for each heat pump are shown in photo below. Installation included the use of special bases to spread the weight of the heat pumps on the roof. When neither heating nor cooling is required, the heat pumps provide continuous air circulation.

Sunnyslope Shopping Center was developed by State Finance Co., of Salem, Ore., at a cost of about $600,000. It covers more than seven acres of land and has 50,000 sq ft of retail store area under roof. Construction is of pre-cast concrete walls, with architectural brick front; roof is of rib-arch type with one inch of rigid Fiberglas insulation. Beams and joists are glue laminated.

Ernest Weber, of Salem, was the architect; D. E. Cooper & Son, also of Salem, installed the system using heat pumps manufactured by Mueller Climatrol Div., Worthington Corp., Milwaukee, Wis.



This view of part of the battery of heat pumps serving the Sunnyslope Shopping Center shows the supply and return duct system for each unit.

Louis Blendermann on PLUMBING and PIPING

Exterior Sand Traps

WHEN sand or sediment enters exterior storm sewer or drainage lines it can, over a period of time, cause serious stoppages in the lines or reduce the effective flow capacity of these lines.

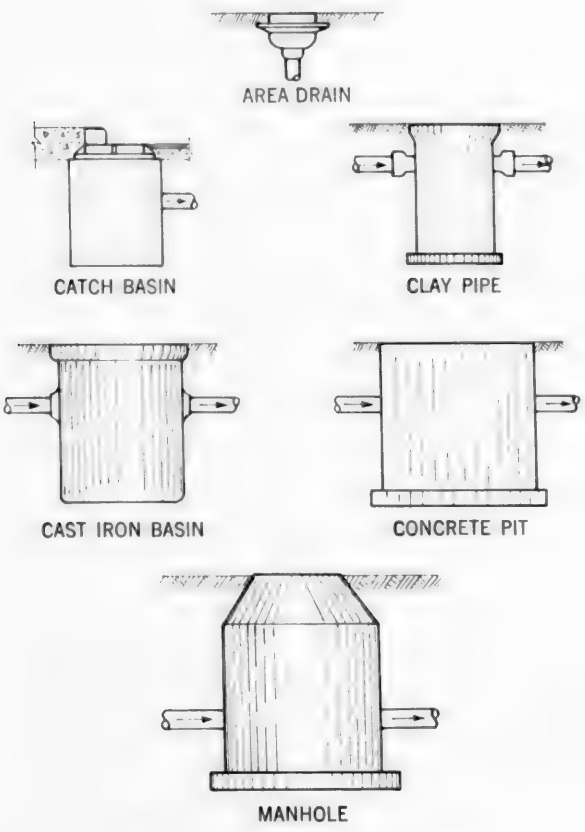


Fig. 1. Several types of sand traps.

Sand and sediment accummulate in the line as the result of being carried into the exterior piping by rain. Since the rain water is often only a gentle flow, the sediment will settle at the bottom of the piping and slowly accumulate until it reaches troublesome proportions. During dry periods, the sediment will harden like cement. Once this hardening occurs, it is difficult to wash away the sediment, even with a heavy flow of rainwater. Rodding may now be required to dislodge the material.

Parking area, school yards, general site areas, walkways and roadways are all exterior surfaces which must be drained. Such surfaces contribute very heavily to the sediment that enters the underground drainage lines. Therefore, in order to avoid this occurrence, it is necessary to provide the means or appurtenances that will intercept and retain the sediment and thus prevent it from entering the drainage lines. Some of the exterior sand traps that may be used for this purpose are described in this article.

Types of Structures

There are many structure types that can be used to intercept sand and sediment. Several of such structures each with a specific purpose, are shown in Fig. 1. These structures include area drains, catch basins, clay pipe interceptors, cast iron basin interceptors, concrete pits and manholes. Now we shall attempt to show the function of some of the structures.

Catch Basin

The catch basin is a structure that offers drainage facilities for streets, roadways, walkways and parking areas. Details of a catch basin are shown in Fig. 2.

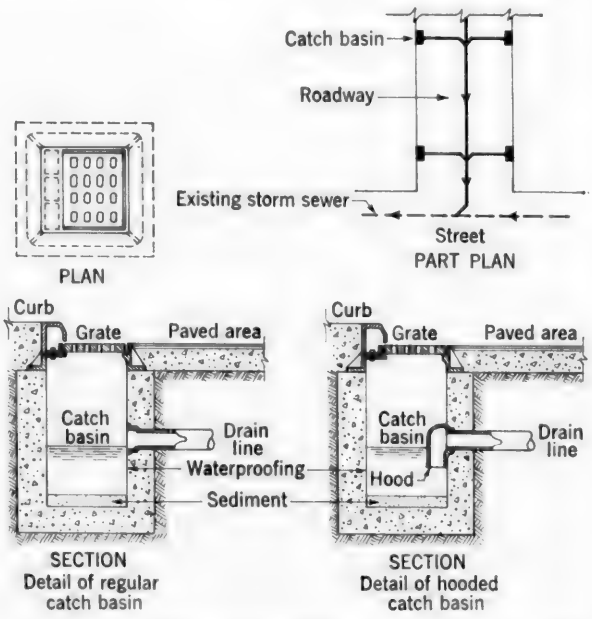


Fig. 2. Two types of catch basins that serve as sand traps.

The catch basin is usually constructed of concrete or brick. When required, reinforced concrete may be used. It is equipped with a frame and cover that can withstand the traffic loads. A grate is provided with slots or square holes that prevent the entry of large foreign objects. When the catch basin is to be a component part of the curb, the frame is constructed as suggested by the detail.

The catch basin often must conform to the standards of the local highway or plumbing departments. If local standards do not prevail, then the unit must reflect the design of the engineer. The depth of the unit is important since this is the pocket that will retain the accumulation of sediment that is intercepted.

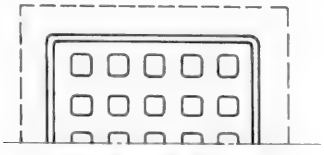
Sediment washed into the pit will settle at the bottom while the clear water will pass on into the drainage piping. Catch basins must be periodically cleaned of the material intercepted.

When a hood is required, it may be a fitting or a manufactured type device, Fig. 2. The hood serves two purposes: (1) it prevents the floating debris in the basin from washing into the drainage line and (2) it serves as a trap seal in preventing foul odors in the drainage line from relieving at the catch basin. In areas where winters are severe, attention must be given to the design of the catch basin. In this event, it is often necessary to omit the pocket and to intercept the sediment at an in-line sand trap where the water due to its depth in ground, will not freeze and block the drainage capacity of the structure.

The part plan of Fig. 2, shows a typical installation of catch basins to serve a roadway. Note that the basins connect with a common drainage line which, in turn, join with the street storm water facilities.

Area Drains

For parking areas it is necessary to provide a system of drains and drainage piping if the rainwater does not run off, by reasons of slope, toward a natural point of discharge. In many areas, the local codes require that drainage be provided for the parking area regardless of its natural runoff. The requirements must be checked with the local authorities.



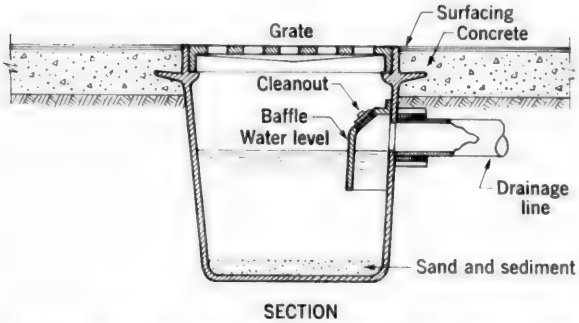


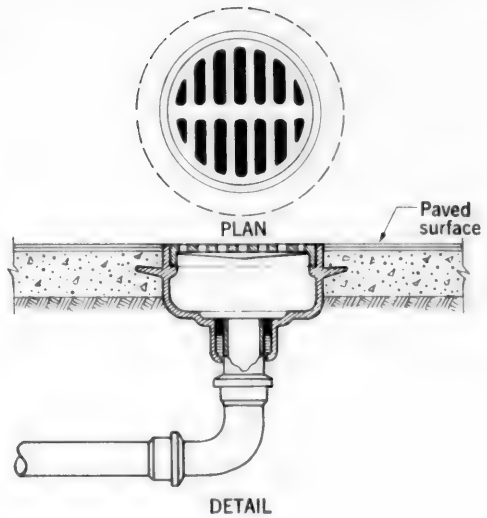
Fig. 3. How a cast iron sump drain can be used to intercept sand and sediment.

A typical area drain, Fig. 3, is constructed entirely of cast iron and is equipped with a heavy duty type grate. The grate must withstand heavy traffic loads imposed by automobiles and trucks. The grate in this instance features small square drainage holes to repel the entry of large foreign objects. Also, the small holes prevent persons, especially children, from wedging their foot in the holes. Area drains may also be constructed of concrete or brick with a cast iron frame and cover fitted on top.

The area drain is so constructed that the sand, sediment and debris will settle at the bottom while the clear water passes on to the drainage line. The hood serves as a trap seal and is equipped with a cleanout to offer access to the drainage line beyond the drain. Many manufactured drains are available. The particular size of an area drain is dependent upon its specific application and the amount of retention capacity desired.

Regular Area Drains

When it is not desired to have the area drain serve



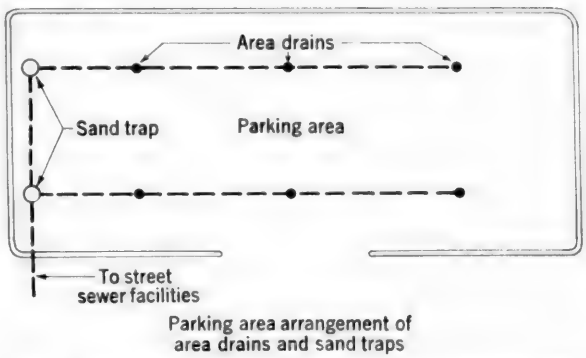


Fig. 4. How sand traps can be installed to serve a system of area drains.

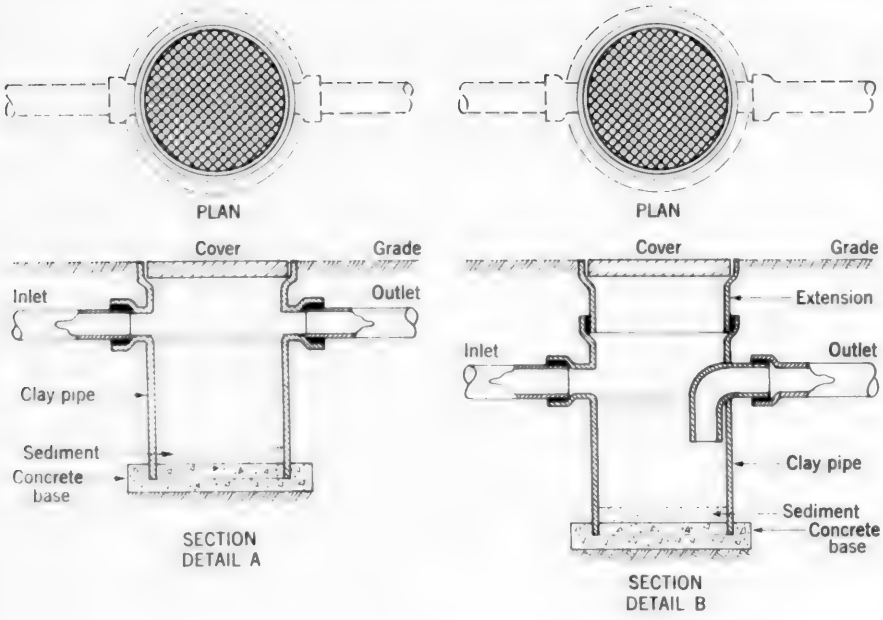


Fig. 5. Use of clay pipe in sand trap design.

as a sand trap, then a regular area drain is generally employed. The regular drain does not include the pocket below the drain outlet for the retention of sand, sediment and debris. Figure 4 shows this type of drain.

The particular drain shown in Fig. 4 is a bottom outlet type. Different sizes and shapes are available. This drain also must be of heavy construction. The grate will be subject to heavy traffic loads and therefore must be very durable. This grate features narrow drainage slots.

The small scale plan shows how the area drains might be arranged for a parking area. The surface of the parking area is sloped toward the drains. The drains are connected to underground piping which, in turn, connects with sand traps that are placed at the edge of the parking field. Many types of sand traps are available and a few will be described.

Clay Pipe Sand Traps

Clay pipe sand traps are quite popular and fulfill broad application needs. This unit, Fig. 5, consists of a length of clay pipe that is either set on a slab of concrete and grouted in place, or is set into the concrete directly after it is poured. Clay pipe is available in several sizes to fit any precise need. The cover can be constructed of cast iron, concrete or wood.

Extensions are easily made. A length of clay pipe is cut to a prescribed length and grouted into the hub of the sand trap with concrete. This arrangement will satisfy any arrangement or elevation of underground drainage piping. When a hood is required, the clay pipe sand trap may be ordered that way, and the benefit of a trap seal is gained.

A clay pipe sand trap will intercept the sand and sediment that is discharged into one or more area drains and prevent this matter from reaching the street storm sewer facilities. Periodic cleaning of sand, sediment and debris, as mentioned for other sand traps, also applies to the clay pipe sand trap.

Cast Iron and Concrete Sand Traps

Sand traps constructed of cast iron or concrete,

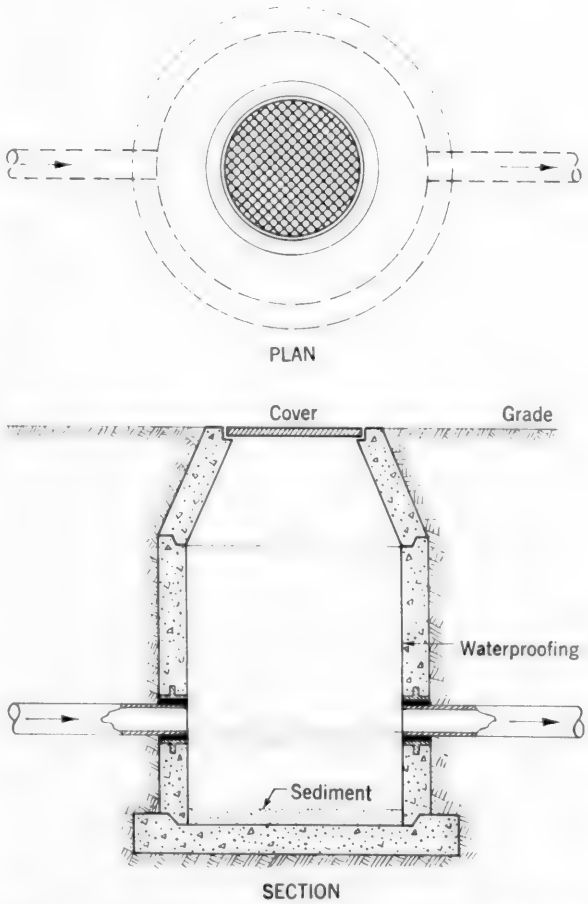


Fig. 6. Installation of a manhole to serve as a sand trap.

similar to those shown in Fig. 1, may also be used for intercepting matter that is discharged into area drains. The cast iron units are available in different sizes to handle any drainage load concentration. The concrete sand traps must be sized properly and equipped with a cast iron frame and cover. Hoods to offer trap seal protection may be incorporated into either the cast iron basin or the concrete pit.

Manholes

When extensive exterior drainage systems are contemplated and the drainage piping will be run rather deep in the ground, the manhole type of interceptor is a very practical unit to consider.

Figure 6 is a manhole usually constructed of concrete, block or brick. When required, reinformed concrete may be used. Its size must be determined by the engineer. The wall thickness too must be given careful consideration with regard to the surface loads to which the structure will be subjected. The cover is cast iron or steel. The pocket needed for the retention of the sediment should be at least 18 to 24 inches in depth. If the engineer so desires, he can make it deeper. Although a hood has not been shown, it can be included if trap seal protection is desired.

Thus the manhole type sand trap is ideal for intercepting the large amounts of sand, sediment and debris that is washed into the area drains of a large and extensive exterior storm drainage systems.

Site Drains

Graded areas and depressed graded areas generally need some means that will drain water accumulations. Area drains may be used for this purpose provided that a sand trap is placed in the underground drainage line to intercept and retain the foreign matter that is washed into the drains. A much more practical approach is to construct a manhole and equip it with a slotted grate to enable this structure to function as an area drain. This is detailed in Fig. 7.

This structure is rather similar in construction to the unit shown in Fig. 6, with the exception that a cast iron frame and grate has been placed at the top of the structure. The grate is equipped with narrow slots to prevent the entry of large foreign objects. Here again, a pocket has been provided at the bottom of the site drain to retain the debris washed into it with the rainwater. If desired, a hood can be used with this type of drain.

Water accumulations are drained from the site by locating these site drains as you would area drains. The elevation shows how the drains might be placed on the site to effectively drain the area. If the area is rather extensive, several rows of site drains may be required. The specific site drain shown here is only for example; the engineer can employ the use of other types of structures he might favor. When sites other than those which are privately owned are involved, it is suggested that the authorities having jurisdiction be consulted for any standards they may wish to follow with regard to the design and construction of the site drain. In any event, the structure should be adequately constructed to avoid the danger

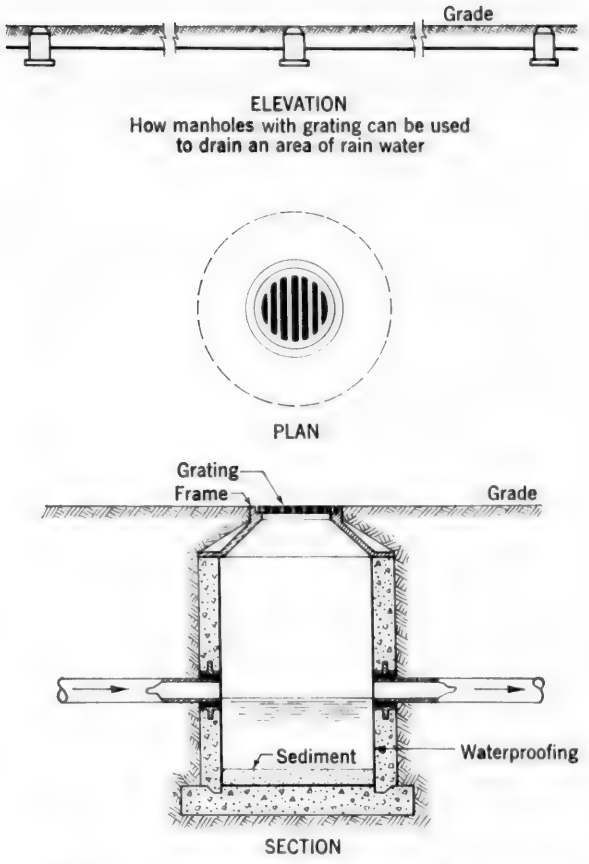


Fig. 7. Manhole equipped with a grating and frame to serve drainage needs of a site.

of collapse and sufficiently strong to withstand heavy surface loads.

Special Sand Traps

Occasionally a special type of sand trap is required to meet unusual needs. An example is an industrial plant where certain waste water is discharged into a stream. The engineer may desire the type of structure that can handle this need.

Similar applications may also demand the need for the special structure shown in Fig. 8, which is constructed of reinforced concrete. It consists of two compartments: In the first the waste water is received and most of the sediment will settle to the bottom of this compartment where it can be easily cleaned; in the second compartment, any of the fine matter that is still suspended in the water will settle at the bottom. The purpose of the baffle is to reduce the turbulence of the waste water as it enters the compartment and thus allow the matter to settle more easily.

The unit shown is open at the top, which would indicate that it is installed in warm areas. When installed in cold areas, the structure is generally placed in an enclosed heated building. Quite often the greenhouse type of building is used. Although not shown in detail, a hood can be installed on the outlet connection in the second compartment, if desired by engineer

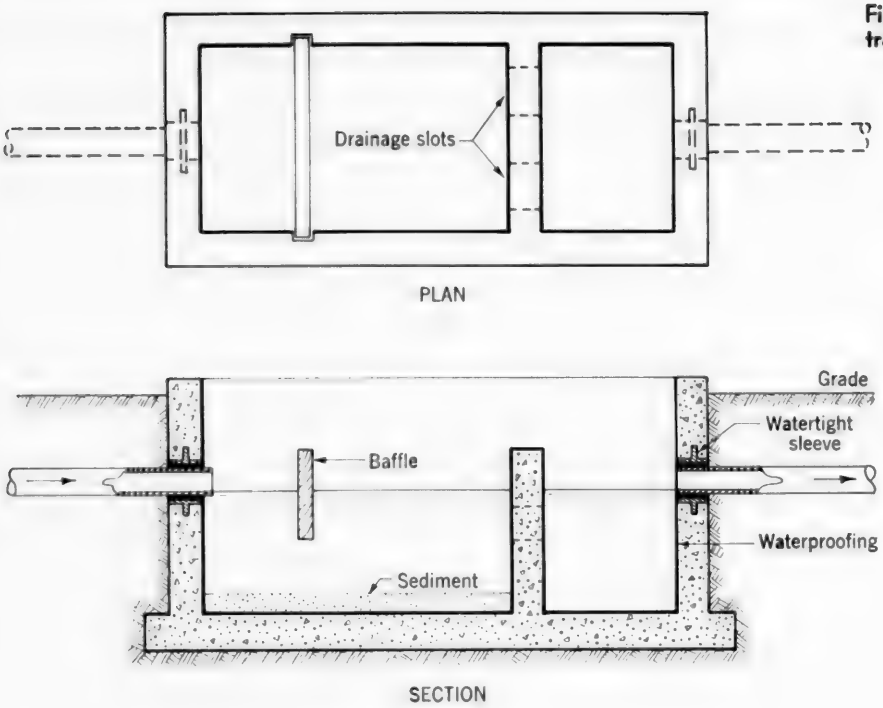


Fig. 8. Details of a large scale sand trap for interior or for exterior applications.

or required by the local code authorities.

This type of sand trap is of value when heavy concentrations of matter are handled and it is not desired to have this matter enter the exterior street sewer facilities. Moreover, the structure has application when solids resulting from industrial or commercial processes are involved. The solids are intercepted and retained by the structure for periodic cleaning.

Regardless of the specific application, there is a structure that can serve the intended purpose. Before starting the proposed design of such a system, it is always good practice to consult with the local plumbing or highway departments for their requirements or suggestions concerning installations. They will also advise on the depth of trap seal to be maintained when hoods are involved.

Water Softening Through Use of Zeolite

Hardness in water is caused by certain mineral substances such as compounds of calcium, magnesium, iron, and aluminum. In most hard waters there is such a preponderance of calcium and magnesium over iron and aluminum that it is customary to consider hardness as being due to these two substances only. Hard waters have several objectionable properties such as those of destroying the cleansing power of soaps and other detergents, causing a greasy ring on utensils at the water surface, and coating or scaling pipes and hot water systems oftentimes so seriously that water flow will be completely stopped. The elimination of these objectionable features may be accomplished by the removal of the calcium and magnesium. This process is called softening.

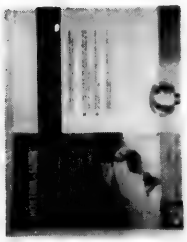
The most convenient method of water softening for the individual is that known as the zeolite process. This involves passing all or a part of the hard water through a closed tank containing a natural or manufactured zeolite. The zeolite reacts with the calcium and magnesium and removes them from the water and in so doing gives up to the water an equal amount of sodium. In time, the zeolite material removes or absorbs all the calcium and magnesium it can and must be regenerated. This can be done quite simply by passing a strong salt (brine) solution back through the unit. After washing the excess brine from the zeolite it is put back into service. It is possible for zeolite filters to soften waters to zero hardness but such water would cause rusting troubles. Therefore, most units have a connection which allows a small amount of untreated water to by-pass the zeolite. This produces a highly satisfactory soft water and avoids rusting problems.

In some locations a water is both iron bearing and hard. Such water can be corrected to clear and soft water at reasonable cost by means of double treatment. The iron and carbon dioxide are first removed by a limestone filter, then the hardness by a zeolite unit.

Adapted from Bulletin 140 "Good Water for Rural Homes" by J. H. Sorrels and P. J. A. Zeller which is available from the Texas Engineering Experiment Station, College Station, Tex.

NEW LITERATURE

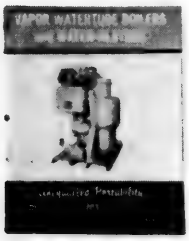
Use the prepaid postcard on last page for securing your copies of these catalogs.



Sizing Water Hammer Arrestors

A new sizing method for selection of water hammer arrestors, considering factors previously ignored, has been put in nomograph form by Zurn Industries, Inc., Erie, Pa. Nomograph and accessory data are available in a 25-sheet pad (form 37 ADV) from the Shoktrol manufacturer.

Circle **Item 1** on Inquiry Card



Boilers and Water Heaters

Portable applications of the company's watertube boilers and water heaters are stressed in 4-page Bulletin No. 4011 by Vapor Heating Corp., Chicago, Ill. Section on specifications includes steam and Btu capacities, pressure ratings, dimensions and approximate shipping weights.

Circle **Item 2** on Inquiry Card

Square Air Diffusers

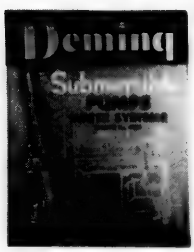
Catalog SQ-70, one of a series of 8 air distribution catalogs available from Anemostat Corp. of America, New York, N.Y., describes the company's square air diffusers. This 16-page catalog provides complete performance data for each diffuser, as well as dimensions and specs.

Circle **Item 3** on Inquiry Card

Resilient Mounted Motors

Bulletin MU-245, from Wagner Electric Corp., St. Louis, Mo., lists motors, 1/6 through 10 hp, available with resilient mountings. The larger ratings were recently developed for central air conditioning units to meet requirements of ultra-quiet equipment operation in hospitals, etc.

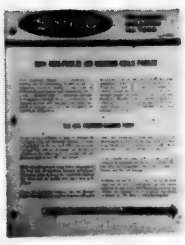
Circle **Item 4** on Inquiry Card



Submersible Pumps and Systems

Submersible pumps and water systems for wells with a minimum diameter of 4 inches are the subject of Bulletin No. 6700-F, published by The Deming Co., Salem, Ohio. Four-page bulletin includes a full-page selection table, plus full description of these pumps and accessories.

Circle **Item 5** on Inquiry Card



Why Heating Coils Freeze

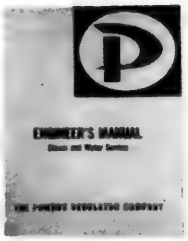
Why non-freeze air heating coils freeze is subject of 4-page bulletin offered by Sarco Co., Inc., New York, N. Y. Bulletin T503 discusses factors leading to freeze-up, provides chart for determining freezing danger point, and offers practical hook-ups to overcome freezing conditions.

Circle **Item 6** on Inquiry Card

Duct Insulation

Microlite, manufactured by Johns-Manville, New York, N. Y., is a lightweight, blanket-type fiber glass insulation for heating, air conditioning, or combination heating-cooling ducts. Six-page Brochure IN-285A describes this product and illustrates standard application methods.

Circle **Item 7** on Inquiry Card



Selection of Automatic Controls

An engineer's manual of steam and water service, intended chiefly as a guide in selection of automatic heating and cooling controls, is offered by The Powers Regulator Co., Skokie, Ill. Manual provides typical examples, offering workable systems to solve steam and water control problems.

Circle **Item 8** on Inquiry Card

Power Gas Conversion Burner

A 4-page bulletin offered by Lennox Industries Inc., Marshalltown, Iowa, explains the mechanics, operation and installation of the company's new power gas conversion burner. Bulletin GC-571-M8 also describes the electric ignition system, and includes specifications and ratings.

Circle **Item 9** on Inquiry Card

Outdoor Condensing Unit

A 4-page brochure covering its products for commercial and industrial air conditioning is announced by Janitrol Heating and Air Conditioning, div. of Midland-Ross Corp., Columbus, Ohio. The featured product is the newly-designed Series 52 outdoor condensing unit.

Circle **Item 10** on Inquiry Card

Sheet Metal Specialties

An 18-page catalog, produced by Duro-Dyne Corp., Farmingdale, N.Y., illustrates and describes its flexible duct connectors, vane rail, blade kits, damper regulators and other sheet metal specialties. Included are new products, such as Drill Screw and Wedge-Loc regulator set.

Circle **Item 11** on Inquiry Card

Industrial Equipment

A 24-page bulletin describing the company's complete line of industrial equipment is available from American-Standard Industrial Div., Detroit, Mich. Bulletin B-5529 gives basic ratings for air conditioning and air handling equipment, fluid drives, heat exchangers, surface condensers, etc.

Circle **Item 12** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Automatic Heating Controls

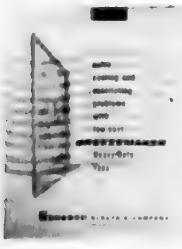
A revised catalog of automatic heating controls is offered by Penn Controls, Inc., Goshen, Ind. Included in Bulletin 1508-AG are several new listings; among these is a line of Click Dial electric heating thermostats. Turning the dial one "click" changes temperature setting one deg.

Circle **Item 13** on Inquiry Card

Pressure and Temperature Recorders

An 8-page catalog, No. 800, describing its pressure and temperature recorders is offered by U. S. Gauge Div., American Machine and Metals, Inc., Sellersville, Pa. Available materials and operating limits are listed for pressure and temperature elements.

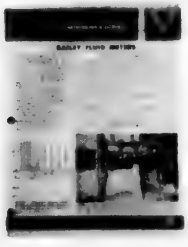
Circle **Item 14** on Inquiry Card



Heavy-Duty Fans

Monarch Electric Co., New Britain, Conn., announces 4-page Bulletin E describing its new, heavy-duty line of industrial and institutional fans. Complete dimensional information, specifications, and application details are given for the 6, 7, and 8-ft dia, belt-driven units.

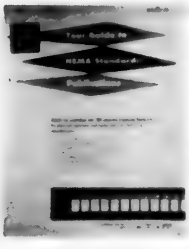
Circle **Item 15** on Inquiry Card



Fluid Meters

Operation, ranges, and installation requirements of the complete line of Bailey fluid meters are included in 8-page Bulletin 20. Integrators, compensators, and primary elements are also discussed in the literature which is available from Bailey Meter Co., Cleveland, Ohio.

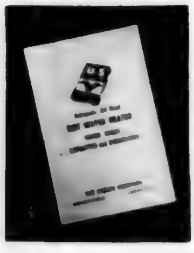
Circle **Item 16** on Inquiry Card



Electrical Equipment Publications

The 1960 Guide to NEMA Standards Publications is available from National Electrical Manufacturers Association, New York, N. Y. These publications cover a wide range of electrical manufacturing equipment, including electric house heating equipment, room air conditioners.

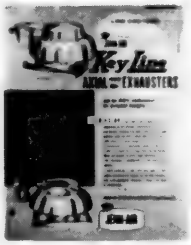
Circle **Item 17** on Inquiry Card



Hot Water Heater Sizing Tables

Sizing tables, capacities and dimensions for automatic, oil-fired hot water heaters constitute a 4-page bulletin offered by The Carlin Co., Wethersfield, Conn. Sizing guides are presented for apartment houses, motels and restaurants, the latter including two-temperature hot water.

Circle **Item 18** on Inquiry Card



Power Roof Exhausters

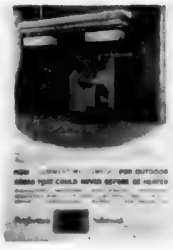
Literature, available from Jenn-Air Products Co., Inc., Indianapolis, Ind., describes the company's Key Line power roof exhausters. Bulletin 60-AK, illustrated, covers axial power roof exhausters; Bulletin 60-CK covers centrifugal units. Performance and dimensional data are included.

Circle **Item 19** on Inquiry Card

Electrical Flow Meters

Remote-reading, electrical flow meters, for liquids and gases at line pressures to 5000 psi, are described in 28-page bulletin by Republic Flow Meters Co., subsidiary of Rockwell Manufacturing Co., Chicago, Ill. Includes piping requirements for orifices, flow nozzles and venturi tubes.

Circle **Item 20** on Inquiry Card



Gas-Fired Infra-Red Heaters

Typical examples of outdoor areas heated with Perfection-Schwank infra-red heaters are illustrated in a 4-page brochure prepared by Perfection Div., Hupp Corp., Cleveland, Ohio. Principles of infra-red heating are explained, and available gas-fired equipment is described.

Circle **Item 21** on Inquiry Card

Incinerators

The incinerators shown in literature offered by United States Incinerator Corp., Boston, Mass., are described as portable incinerators with the double combustion chamber feature usually found only in the largest destructors. Line includes top fed, flue fed, and inclined-type units.

Circle **Item 22** on Inquiry Card

Plug Valves

An 8-page bulletin, No. 110, from DeZurik Corp., Sartell, Minn., describes DeZurik Eccentric valves. Bulletin lists features of these plug valves, as well as materials, pressure ratings, dimensions, applications and accessories. Automatic control is possible.

Circle **Item 23** on Inquiry Card

Centrifugal and Turbine Type Pumps

A 4-page condensed catalog, offered by Aurora Pump Div., The New York Air Brake Co., Aurora, Ill., describes Aurora centrifugal and Apco turbine type pumps in single and multiple stage, flexible and close-coupled, horizontal and vertical models. Includes capacity and head ranges.

Circle **Item 24** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.

Heavy Duty Coils

A 44-page bulletin (B-1518) describing heavy duty coils for standard steam, steam distribution, and hot water is available from American-Standard Industrial Div., Detroit, Mich. Coil selection is discussed; specific problems are presented with solution procedure for each coil type.

Circle **Item 25** on Inquiry Card

Tube and Pipe Insulation

An expanded-cell type tube and pipe insulation, called highly suited for air conditioning and refrigeration lines, is the subject of a 4-page bulletin offered by Presstite Div., American-Marietta Co., St. Louis, Mo. Bulletin lists advantages, specifications for Presst-O-Cell insulation.

Circle **Item 26** on Inquiry Card

Industrial Strainers

An 88-page handbook containing sizing and selection data for industrial and marine strainers is published by Tate Engineering, Inc., Baltimore, Md. This guide contains reference data for the layout of fluid flow systems and sizing of strainers, and valve and pipe selection information.

Circle **Item 27** on Inquiry Card

Submersible Water Pumps

An 8-page illustrated bulletin is available from Sumo Pumps, Inc., Stamford, Conn., describing its heavy-duty, high-capacity submersible water pumps. Bulletin B-1300 outlines the ways in which the pumps can be used for deep well pumping and as in-line boosters.

Circle **Item 28** on Inquiry Card

Corrosion Resistance Rating Guide

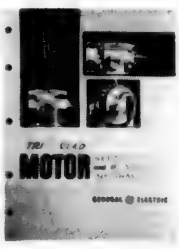
A guide listing the relative ability of metals, plastics and synthetic rubbers used in the manufacture of Flo-Ball valves to resist the corrosive effects of almost four-hundred different fluids encountered in industry is issued by Hyromatics, Inc., Livingston, N. J.

Circle **Item 29** on Inquiry Card

Water Pressure Reducing Valves

Leslie Co., Lyndhurst, N. J., announces a 4-page bulletin on water pressure reducing valves. Bulletin tells how proper valve selection and application can reduce "hidden costs" connected with the use of water in industry, and it includes information on proper sizing procedures.

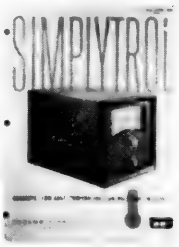
Circle **Item 30** on Inquiry Card



Induction Motors

General Electric Co., Schenectady, N. Y., offers 14-page selection, application and buying guide for Tri-Clad '55' motors, single-and-three-phase, from ¾ to 150 hp. Application chart shows types recommended for various loads and ambient conditions; tables give dimensions, performance data.

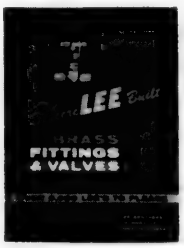
Circle **Item 31** on Inquiry Card



Temperature Control Packages

Simple and inherently stable temperature control packages, known as Simplytrols and applicable to a wide variety of industrial processes, are described in 12-page Bulletin 108 by Assembly Products, Inc., Chesterland, Ohio. Bulletin explains operation, circuitry and safety features.

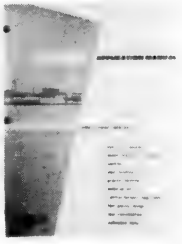
Circle **Item 32** on Inquiry Card



Cast Brass Fittings and Valves

Cast brass fittings and valves built by Lee Brothers Foundry Co., Inc., Anniston, Ala., are pictured and described, with dimensions, in 60-page Catalog No. 60. Sections include solder, drainage and flared tube fittings; flanged and screwed fittings; valves; and engineering data.

Circle **Item 33** on Inquiry Card



Industrial Heating

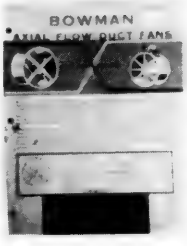
Described as a single data source for design of industrial heating jobs using direct fired heaters (with heat exchangers), a 64-page application manual is offered by Lennox Industries Inc., Marshalltown, Iowa. Text describes direct fired heating systems, and includes all necessary design data.

Circle **Item 34** on Inquiry Card

Armored Pipe and Fittings

Haveg Industries, Inc., Wilmington, Del., announces 4-page Bulletin FRP-1 which describes the properties of F.R.P. (fiber glass reinforced plastic) armored pipe and fittings for chemical corrosion control. Selection data, such as corrosion resistance and pressure-temperature ratings, are included.

Circle **Item 35** on Inquiry Card

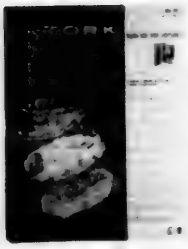


Axial Flow Duct Fans

Bowman Steel Corp., Pittsburgh, Pa., offers 2-page Bulletin AF-1 which describes the company's axial flow duct fans. Line includes both direct drive fans for moving non-corrosive, moderate temperature air, and belt-driven units for high temperatures or corrosive atmospheres.

Circle **Item 36** on Inquiry Card

Use the prepaid postcard on last page for securing your copies of these catalogs.



Heating and Lighting Controls

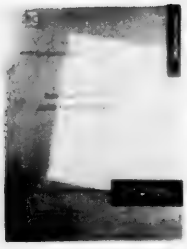
Seven-day time switches are the subject of a 4-page application bulletin, No. 72, offered by Tork Time Controls, Inc., Mount Vernon, N. Y. Detailed drawings show wiring plans for general applications in lighting, air conditioning, and ventilating, and for specific heating control.

Circle **Item 37** on Inquiry Card

Tin-Lined Piping

Wakefield tin-lined pipe is called by the manufacturer, Lead Lined Iron Pipe Co., Wakefield, Mass., the perfect solution for distilled water handling. A 4-page bulletin describes this pipe and also tin-lined fittings, diaphragm valves and faucets. Installation procedure is outlined.

Circle **Item 38** on Inquiry Card



Stoker-Fired Industrial Plants

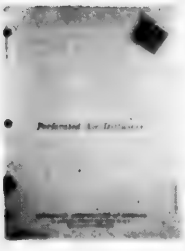
A 78-page brochure, GS-2, offered by Bituminous Coal Institute, National Coal Association, Washington, D. C., provides design criteria on ram-type underfeed stoker-fired steam plants that have loads of 10,000 to 40,000 lb steam per hr. Data cover boilers, stokers, ash handling, etc.

Circle **Item 39** on Inquiry Card

Nickel-Lined Water Heaters

Nick-O-Line nickel-lined water heaters were designed, according to Commercial Heater Co., Fort Worth, Tex., to meet modern industrial and commercial hot water demands. A 4-page bulletin describes these heaters and their nickel lining, and presents complete specifications.

Circle **Item 40** on Inquiry Card



Perforated Air Diffusers

Anemostat Corp. of America, New York, N. Y., also offers Catalog P-70 describing its perforated air diffusers. This 12-page catalog lists dimensions and performance data for these diffusers, and includes selection data, balancing and volume control information.

Circle **Item 41** on Inquiry Card

Industrial Valves

Industrial valves from The Ohio Injector Co., Wadsworth, Ohio, are described and illustrated in company's 28-page Diamond Anniversary catalog digest, No. CD-2. Included are iron, bronze, cast steel and forged steel valves, and a miscellaneous group of accessories.

Circle **Item 42** on Inquiry Card

Boiler-Burner Unit

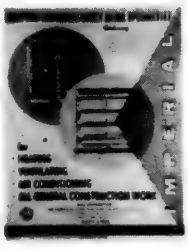
Featuring performance data and dimensions in a 2-page spread, Bulletin 4, from Industrial Combustion Inc., Milwaukee, Wis., describes the Highlander, a Scotch-type, automatic boiler-burner unit. Construction features and operating advantages are included in 4-page bulletin.

Circle **Item 43** on Inquiry Card

Multizone Air Conditioners

A revised, 8-page catalog on multizone air conditioners is announced by Recold Corp., Los Angeles, Calif. Catalog No. 55C9a includes engineering data, dimensions and specifications for the entire series of units, which are equipped for simultaneous heating and cooling applications.

Circle **Item 44** on Inquiry Card



Dampers and Louvers

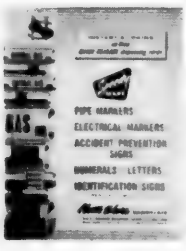
Dampers, louvers and other sheet metal specialties manufactured by Imperial Damper Co., New York, N. Y., are described in a 12-page catalog. Featured is an automatic, louvered fire damper which is called the first Underwriters' Laboratories approved and labeled fire damper.

Circle **Item 45** on Inquiry Card

Cooling Towers

Baltimore Aircoil Co., Inc., Baltimore, Md., announces 28-page Bulletin 207 which describes its line of fireproof cooling towers from 10 to 700 tons in single, factory-assembled units. Includes engineering drawings, capacity and performance data, and selection tables.

Circle **Item 46** on Inquiry Card



Pipe Markers

A 24-page catalog, issued by North Shore Nameplate, div. of Anodyne, Inc., Bayside, N. Y., provides selection and installation information on pipe markers, electrical markers, numerals, letters and identification signs. Pipe markers are shown in color, in 5 different printing styles.

Circle **Item 47** on Inquiry Card

Heat Exchangers

A 102-page, 3-ring catalog binder, comprising 13 separate bulletins describing standard Ross shell and tube heat exchangers, is available by letterhead request to American Standard Industrial Div., Detroit 32, Mich. Information is broken down into four categories: Coolers, Heaters, Heat Exchangers and General Data.

DEGREE-DAYS FOR APRIL, 1960

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 32nd Year of Publication of Monthly Degree-Day Data

City	April			Season to Apr. 30, incl., from Sept. 1		
	1960	1959	Normal	1959-60	1958-59	Normal
Abilene, Texas (A)	81	183	113	3008	2826	2707
Albany, New York (A)	457	502	597	6450	6916	6642
Albuquerque, New Mexico (A)	211	249	289	4204	4057	4319
Alpena, Michigan (C)	728	704	762	7951	7699	7366
Anchorage, Alaska (A)	923	931	888	9188	9969	9322
Asheville, North Carolina (C)	226	249	285	4326	4017	3962
Atlanta, Georgia (A)	96	108	133	3155	2787	2806
Atlantic City, New Jersey (C)	368	367*	468	4574	5002*	4528
Augusta, Georgia (A)	78	95	62	2795	2479	2138
Baltimore, Maryland (C)	197	218	326	4179	4186	4130
Billings, Montana (A)	600	616	564	6728	6398	6655
Binghamton, New York (C)	418	518	570	5824	6604	6232
Birmingham, Alabama (A)	97	124	128	3021	2827	2758
Bismarck, North Dakota (A)	587	643	657	8580	8589	8496
Block Island, Rhode Island (A)	556	561	603	5149	5527	5385
Boise, Idaho (A)	475	421	453	6052	4872	5549
Boston, Massachusetts (A)	493	476	534	5282	5728	5506
Buffalo, New York (A)	494	562	636	6315	6588	6405
Burlington, Iowa (A)	362	432	425	6406	6112	5888
Burlington, Vermont (A)	624	594	681	7348	7795	7420
Cairo, Illinois (C)	148	190	182	4247	3861	3709
Charleston, South Carolina (C)	52	55	43	2198	1851	1769
Charlotte, North Carolina (A)	124	145	172	3440	3190	3176
Chattanooga, Tennessee (A)	140	171	179	3735	3524	3339
Cheyenne, Wyoming (A)	542	767	717	6932	6663	6855
Chicago, Illinois (A)	374	466	507	6140	6135	6023
Cincinnati, Ohio (C)	207	231	314	4650	4419	4424
Cleveland, Ohio (A)	430	451	531	5843	5885	5727
Columbia, Missouri (A)	272	318	326	5499	4901	4958
Columbia, South Carolina (A)	84	95	77	2898	2609	2284
Columbus, Ohio (C)	305	348	408	5306	5390	5102
Concord, New Hampshire (A)	591	577	660	6607	7250	7146
Concordia, Kansas (C)	291	363	341	5995	5217	5157
Dallas, Texas (A)	51	141	75	2760	2444	2272
Denver, Colorado (A)	434	572	525	5971	5532	5765
Des Moines, Iowa (A)	415	467	438	7020	6364	6183
Detroit, Michigan (A)	446	486	558	6111	6264	6085
Devils Lake, North Dakota (C)	780	731	750	9855	9295	9301
Dodge City, Kansas (A)	247	370	347	5516	5006	4908
Dubuque, Iowa (A)	488	557	543	7458	7343	6892
Duluth, Minnesota (A)	786	793**	801**	9193	9218**	8730**
Elkins, West Virginia (A)	(a)	442	477	(a)	5769	5456
El Paso, Texas (A)	58	86	110	2504	2406	2641
Ely, Nevada (A)	649	598	639	7095	6320	6759
Escanaba, Michigan (C)	735	773	804	7792	8189	7863
Evansville, Indiana (A)	236	264	251	4931	4631	4264
Fairbanks, Alaska (A)	1145	1166	1083	12928	14047	12974
Fargo, North Dakota (A)	708	649	687	9050	8564	8769
Fort Smith, Arkansas (A)	117	179	127	3753	3412	3164
Fort Wayne, Indiana (A)	404	470	516	6221	6243	5991
Fort Worth, Texas (A)	54	143	90	2823	2549	2356
Fresno, California (A)	161	38	145	2338	1973	2489
Galveston, Texas (C)	11	41	30	1570	1332	1211
Grand Junction, Colorado (A)	359	369	402	5597	4972	5628
Grand Rapids, Michigan (A)	488	580	606	6613	6880	6647
Green Bay, Wisconsin (A)	617	663	696	7797	8136	7715
Greensboro, North Carolina (A)	176	208	241	4135	3875	3760
Greenville, South Carolina (A)	130	141	161	3455	3048	3028
Harrisburg, Pennsylvania (A)	292	307	423	5072	5250	5116
Hartford, Connecticut (A)	439	463	528	5750	6188	5893
Havre, Montana (C)	612	628	597	7740	7793	7717
Helena, Montana (A)	682	651	654	7726	7404	7606
Houston, Texas (C)	5	69	27	1653	1430	1276
Huron, South Dakota (A)	583	543	558	8451	7634	7517
Indianapolis, Indiana (A)	333	397	432	5813	5656	5405
Jackson, Mississippi (A)	57	127	81	2812	2498	2202
Juneau, Alaska (A)	713	781	765	6791	7472	7334
Kansas City, Missouri (A)	238	273	292	5275	4557	4769
Knoxville, Tennessee (A)	158	182	196	3919	3607	3540
La Crosse, Wisconsin (A)	501	519	552	7361	7544	7295
Lander, Wyoming (A)	982	990	687	7026	6453	7714
Lewiston, Maine (O)	642	624	693	6603	7291	7318

a) Data not available.
* Figures based on Airport readings.
** Figures based on City office readings.

Normal figures in this table are based on 30-year period covering 1921 to 1950, inclusive, as compiled and published by the U. S. Weather Bureau.

Figures in this table, with two exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of the Coke Sales Department, Central New York Power Co., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively. [Table concluded on page 104]

Degree-Days for April, 1960 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING's 32nd Year of Publication of Monthly Degree-Day Data

City	April			Season to Apr. 30, incl., from Sept. 1		
	1960	1959	Normal	1959-60	1958-59	Normal
Lincoln, Nebraska (C)	355	393	377	6553	5542	5654
Little Rock, Arkansas (A)	81	146	122	3477	3030	2964
Los Angeles, California (C)	65	29	129	889	684	1364
Louisville, Kentucky (A)	197	222	285	4591	4357	4340
Lynchburg, Virginia (A)	206	230	289	4370	4107	4066
Macon, Georgia (A)	65	75	62	2550	2172	2049
Madison, Wisconsin (A)	513	557	573	7491	7517	6915
Marquette, Michigan (C)	746	787	789	7829	7942	7707
Memphis, Tennessee (A)	91	155	139	3520	3204	3113
Meridian, Mississippi (A)	82	107	85	2831	2575	2324
Milwaukee, Wisconsin (A)	515	592	621	7020	7187	6693
Minneapolis, Minnesota (A)	574	530	570	7840	7374	7489
Moline, Illinois (A)	376	462	453	6704	6328	6112
Montgomery, Alabama (A)	60	78	80	2471	2171	2137
Nashville, Tennessee (A)	171	192	186	4102	3722	3470
New Haven, Connecticut (A)	459	485	567	5356	5793	5695
New Orleans, Louisiana (C)	5	27	19	1547	1298	1175
New York, New York (C)	358	365	456	4797	4981	4879
Newark, New Jersey (A)	322	343	450	4730	5051	5093
Norfolk, Virginia (A)	152	180	265	3528	3302	3395
North Platte, Nebraska (A)	457	550	489	7136	6409	6227
Oak Ridge, Tennessee (C)	206	211	227	4069	3880	3970
Oakland, California (A)	240	146	282	2199	1898	2671
Oklahoma City, Oklahoma (A)	134	248	169	4182	3860	3481
Omaha, Nebraska (A)	379	426	389	6777	5947	5948
Parkersburg, West Virginia (C)	248	303	347	4911	4921	4618
Peoria, Illinois (A)	374	418	435	6407	6004	5843
Philadelphia, Pennsylvania (C)	243	277	369	4350	4550	4430
Phoenix, Arizona (A)	14	0	62	1451	1112	1492
Pittsburgh, Pennsylvania (C)	287	338	402	5006	5163	4898
Pittsfield, Massachusetts (A)	546	595	690	6873	7298	7165
Pocatello, Idaho (A)	(a)	512	561	(a)	5811	6523
Portland, Maine (A)	674	653	693	6725	7390	7099
Portland, Oregon (C)	361	336	347	3938	3472	3847
Providence, Rhode Island (A)	480	473	570	5522	5893	5783
Pueblo, Colorado (A)	340	486	456	5918	5260	5479
Raleigh, North Carolina (A)	159	179	172	3781	3520	3046
Rapid City, South Dakota (A)	820	643	615	7497	6589	6974
Reading, Pennsylvania (C)	283	294	411	4828	5052	4921
Red Bluff, California (A)	210	36	177	2385	1763	2495
Reno, Nevada (A)	497	435	519	5604	5016	5465
Richmond, Virginia (A)	184	212	271	4123	3869	3889
Rochester, New York (A)	491	545	615	6561	6738	6477
Roswell, New Mexico (A)	120	212	185	3600	3540	3396
Sacramento, California (C)	164	45	196	2262	1760	2510
St. Joseph, Missouri (A)	310	363	297	6012	5336	4591
St. Louis, Missouri (C)	235	258	270	4926	4462	4368
Salt Lake City, Utah (A)	419	404	453	5920	4967	5552
San Antonio, Texas (A)	14	90	34	1940	1768	1579
San Diego, California (A)	89	29	151	961	676	1416
Sandusky, Ohio (C)	389	449	513	5824	5930	5601
San Francisco, California (C)	268	213	279	1879	1650	2275
Sault Ste. Marie, Michigan (A)	815	864	846	8393	8795	8517
Savannah, Georgia (A)	58	60	43	2261	1884	1710
Scranton, Pennsylvania (A)	393	429	516	6039	6325	5798
Seattle, Washington (C)	370	378	396	3923	3718	3991
Sheridan, Wyoming (A)	612	690	645	7397	7134	7287
Shreveport, Louisiana (A)	37	127	61	2719	2392	2117
Sioux City, Iowa (A)	460	470	474	7551	6652	6705
Spokane, Washington (A)	567	517	561	6756	5932	6331
Springfield, Illinois (A)	301	364	350	5875	5477	5084
Springfield, Missouri (A)	253	305	295	5034	4526	4551
Syracuse, New York (A)	468	516	570	6398	6794	6207
Toledo, Ohio (A)	451	485	555	6303	6341	6077
Topeka, Kansas (C)	288	361	295	5788	5098	4794
Trenton, New Jersey (C)	294	334	429	4774	5040	4924
Tulsa, Oklahoma (A)	161	196	173	4107	3586	3540
Utica, New York (O)	463	445	588	5993	6717	6543
Valentine, Nebraska (A)	552	597	543	7644	6876	6683
Walla Walla, Washington (C)	347	335	338	4961	4295	4639
Washington, D. C. (A)	200	235**	314**	4190	4156**	4178**
Wichita, Kansas (A)	204	300	280	5100	4627	4463
Williston, North Dakota (C)	667	658	663	8717	8447	8499
Winnemucca, Nevada (A)	585	533	546	6314	5554	5942
Yakima, Washington (A)	473	426	408	5934	5439	5580

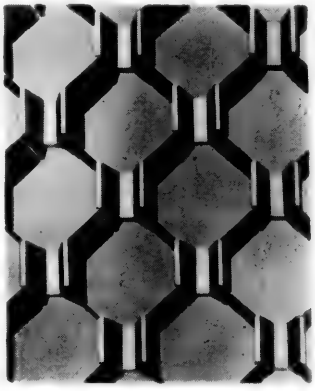
For footnotes, see page 103

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on the last page for securing additional information about new equipment and materials described in this department.

Grille Provides Solar Protection

Exceptional opportunities for original architectural expression are said to be offered by the C/S Octalinear, an all-aluminum grille introduced by Construction Specialties, Inc., Cranford, N. J.



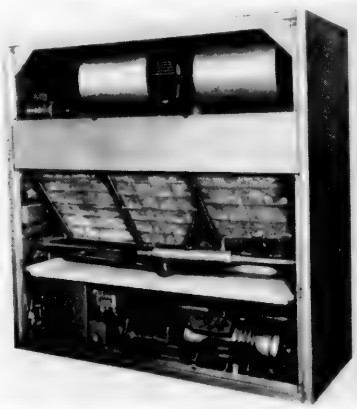
Functionally, the C/S Octalinear is reported to give up to 100% solar protection, allowing use of glass for vision, light and a feeling of openness without glare. By placing walls in shadow, it reduces heat gain and air conditioning requirements, and also eliminates the need for costly facing materials. A free area of 80% is possible, varying with cell design.

Its all-aluminum construction makes the grille rigid, rugged and durable, yet unusually light in weight, requiring minimum support. And, fabrication methods are such as to make the grille moderate in cost.

More information? Circle Item 48, postcard, last page.

Packaged Air Conditioners

Dunham-Bush, Inc., West Hartford, Conn., announces a new line of packaged air conditioners designed for use



wherever high capacity, self-contained air conditioning units are required.

Ruggedly constructed for heavy duty use, the company reports, they are attractively finished to harmonize with practically any decor, and engineered for installation either within the conditioned area or at a remote location.

Available in 10, 15, 20, 25, and 30-hp capacities, "PAC" units are compact, quiet in operation, and easily adapted (in the field) for connection to duct work.

The 20, 25, and 30-hp models are equipped with dual compressors. The 10 and 15-hp models are available with free air discharge plenum and may be had with steam coils in the plenum. All models can be used with steam coils in the duct system; all can be furnished with fresh air inlets. Refrigerant superheaters are standard on all models.

More information? Circle Item 49, postcard, last page.

New Hermetic Compressor

A 1½-hp hermetic compressor weighing only 47 lb is announced by York Div., Borg-Warner Corp., York, Pennsylvania.

Said to be particularly adaptable for room and residential air conditioning, this lightweight compressor, Model F-2556, is only 11⅞ inches high, 10-13/32 inches wide, and is 8½ inches deep. The firm reports the capacity of the new compressor at normal rating condition to be 16,300 Btu per hr.

Compressor can be furnished for either 230/60/1 or 208/60/1 service. It is available with two styles of mounting legs and with either top or side suction inlet. It also features an internal resilient mount and external mounts of either rubber cushions or springs to keep operating sound to a minimum.

More information? Circle Item 50, postcard, last page.

Multiple-Choice Financing Package

Announced by Carrier Corp., Syracuse, N. Y., is a new multiple-choice financing package for its industrial and commercial customers. The expanded service now offers a choice of either leasing equipment, or purchasing it through an installment plan as well as on a conventional cash basis. It is the most complete financing plan in the industry, the company reports.

Under the new program the leasing of Carrier equipment will be exclusively handled nationwide by United States Leasing Corporation, San Francisco, the nation's largest leasing company. Leases will be originated and processed through the 80 branch offices of Carrier's affiliate, Appliance Buyers Credit Corp., St. Joseph, Mich., which also finances the installment purchase plans.

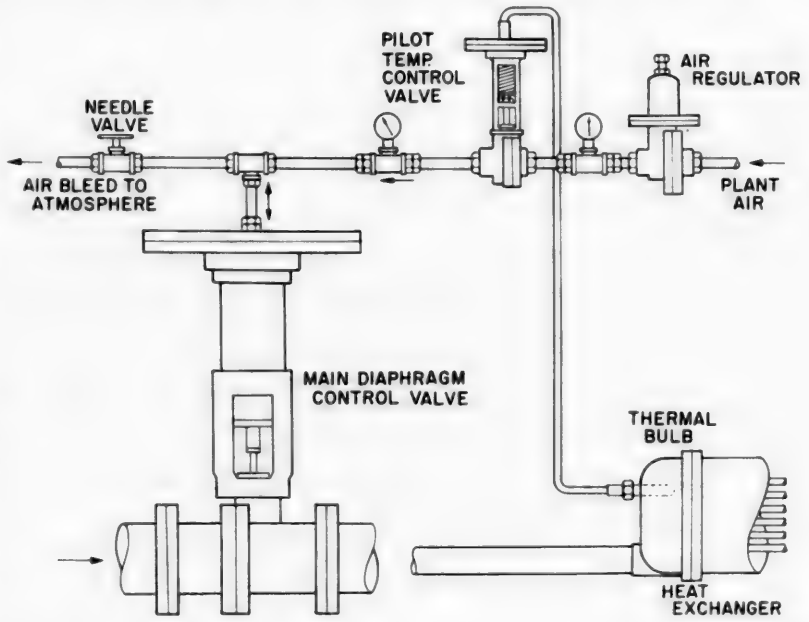
More information? Circle Item 51, postcard, last page.

Temperature Control Valve Has 50,000 Lb Steam per Hour Capacity

Available from OPW-Jordan Corp., Cincinnati, Ohio, in 4 and 6-inch sizes are sliding gate temperature control valves. Air operated, capacities to 50,000 lb. steam per hr., or 2,500 gpm of water are offered. They are used for heating or cooling service and wherever large capacities, accurate control, and tight shut-off are required, the company states.

Typical industrial applications include controlling temperatures in heat exchangers, molding presses, plating tanks, cooling jackets, and water condensers.

The entire system, as illustrated, or just the valves can be purchased. Shown is a diagram of a typical application, consisting of a 4- or 6-inch diaphragm control valve, ¼-inch temperature control valve, needle valve, and air regulator, plus two gages. Not shown, but included, is by-pass system including two gate valves and one globe valve.



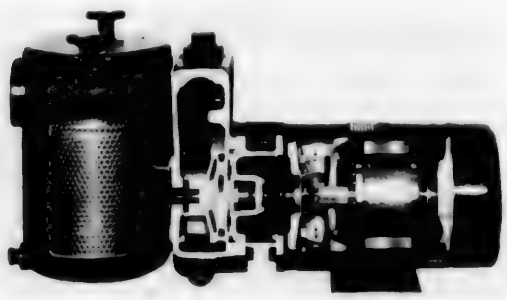
System is suitable for pressures to 250 psi and temperatures to 500 deg F. It will control temperatures from 35 to 450 deg. No. 180-170F valve is cast iron with 125-lb ASA flanges. No. 180-370F is ductile iron with 250-lb ASA flanges. Pilot is ¼-inch screwed end, ductile iron.

Thermal bulbs are available in copper, stainless steel, plastic-covered copper, with capillary and armor of similar materials. Sliding gate seats are self-cleaning and self-lapping in operation to give tight shut-off and minimum maintenance, according to the company.

More information? Circle Item 52, postcard, last page.

Swimming Pool Pump

A versatile, self-priming centrifugal pump for motel-size and commercial swimming pools, using diatomite filters, has been made possible due to a special adaptation of 2- and 3-hp jet pump motors, according to Marlow Pumps, a division of Bell and Gossett Co., Midland Park. N. J.



Application of A. O. Smith jet pump motors is said to have allowed Marlow to take advantage of the motor's particular electrical characteristics and its reduced starting torque which minimizes wear on the pump bearings and seals. The motors also allow relatively stable speed over a wide load range, which allows the pump to operate at surge loads with practically no change in the volume of liquid delivered.

The use of the jet pump motors also offers the added benefit of locating the switch capacitor and thermostat under the canopy, thus protecting them from mechanical damage.

More information? Circle Item 53, postcard, last page.

Encapsulated Windings on Motors

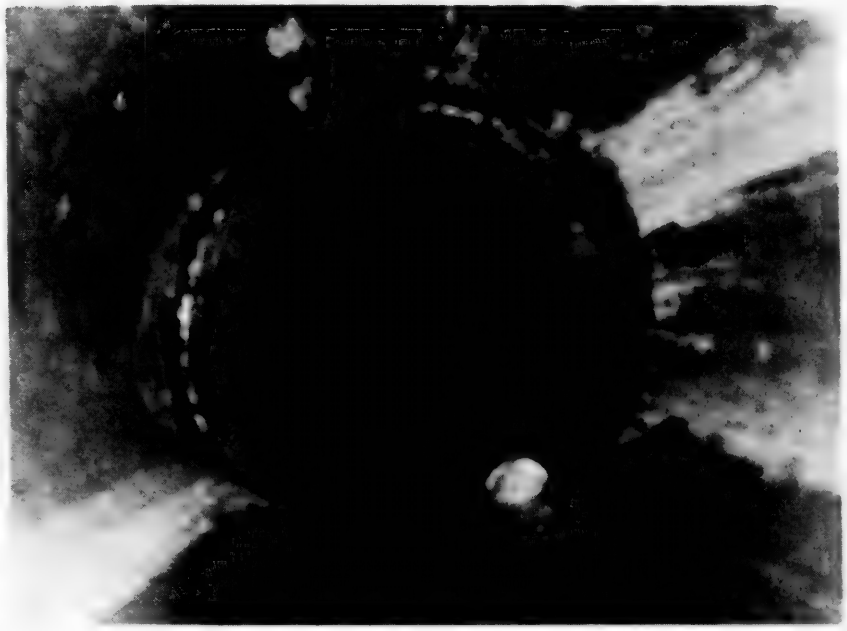
As a result of several years of experimenting with new insulating materials and vacuum molding processes, U. S. Electrical Motors Inc., Los Angeles, Calif., has developed a protection for windings functioning under adverse environmental conditions where conventional motor insulations have short life expectancy. The new protection is trade-marked Everseal, and is now available on all motor types.

Molded in rigid high-grade resin, encapsulated windings are fully protected against the attacks of excessive moisture, acids, and gases (even in high concentrations); alkali or caustic conditions (lye, potash, ammonia, caustic soda); abrasives, carbon black, graphitic dusts, and numerous other contaminants, the company states.

More information? Circle Item 54, postcard, last page.

Camera System Reveals Internal Condition of Buried Lines

Heretofore it has been almost impossible to ascertain the internal condition of sanitary sewer lines, once they have been placed in the ground and backfilled, without resorting to costly excavation. Now, however, a system which is called the answer to infiltration determination is announced by Jersey Testing Laboratories, Inc., Newark, N. J.

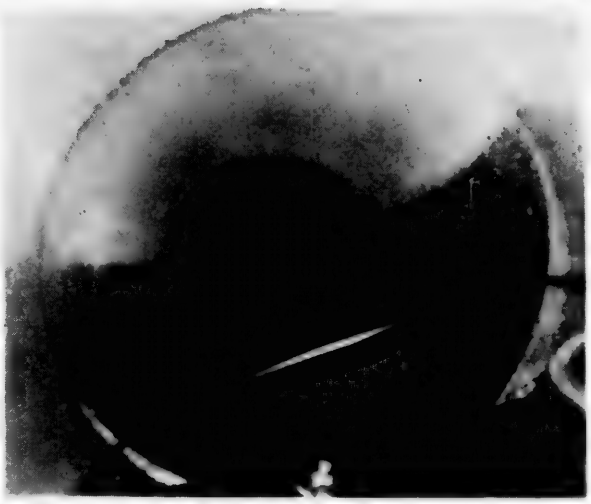


The system is based on an automatic camera capable of providing a film study which records a 360-degree picture, in full color, at predetermined intervals throughout an entire line. The exact location of each picture taken by the camera, as it moves through the line between any two given manholes, can be pinpointed; this enables a permanent, joint-by-joint record of the line to be on file.

This method eliminates expensive excavations previously required merely to investigate where a suspected trouble-making pipe might be located, with no guarantee that the results would be conclusive. The camera study, however, puts the interpreter in a position to eliminate certain lines as trouble spots, or to record lines which are contributors to the overall infiltration problem.

The camera system has been used successfully in 8, 12 and 24-inch vitrified clay lines and in 8-inch Transite lines, but it is not limited to these sizes, the firm reports.

Two black and white reproductions of color photos taken with the camera illustrate its application. The larger photo shows 8-inch vitrified clay line with misaligned joint covered with root growth, and heavy infiltration along the right and left sidewalls. The smaller photo is view of 8-inch Transite line showing extreme joint misalignment, due to poor workmanship, along right lower sidewall.



More information? Circle Item 55, postcard, last page.

3-Hp Condensing Unit

Introduction of a 3-hp condensing unit, Model 1204-00, with a new die-cast aluminum compressor and larger coils, is announced by Airtemp Div., Chrysler Corp., Dayton, Ohio.

The die-cast aluminum compressor and an enlarged condensing area are said to give the unit its full 35,000-Btu capacity as certified by Air Conditioning and Refrigeration Institute standards. According to the manufacturer, these innovations have given the unit a greater cooling capacity and resulted in an extremely quiet unit.

The compressor floats on rubber mounts and flexible connections absorb twist and strain to lengthen the life of the copper connections. A corrosion-resistant epoxy primer, top coated with gray baking enamel, protects the steel-bonderized cabinet. The cabinet measures 32⅜ by 39½ inches and can be installed in an 8.9-sq ft space.

A redesigned venturi top assures an increased, proportioned air flow and the condensing unit is equipped with a receiver for refrigerant to provide wide application despite load differences in various installations.

Installation has been made easier with the company's deluxe control panel, requiring minimum field wiring, and a climate-minder thermostat which permits the resetting of all controls by turning the thermostat to the *off* position and back to the automatic setting.

More information? Circle Item 56, postcard, last page.

(Continued on page 109)

and they run
and they run
and they run

1903—
Indianapolis.
a trolley car.
a rolling adventure surrounded by noise.
pennies, nickels, children . . .

and inside—
a Fairbanks Morse electric motor.
it drove the trolley over thousands of miles
and rode with it
into glorious retirement.

pick a year—
from the turn of the century until now.
pick a month,
pick a day,
pick a city,
pick a town—
our motors are in its history . . .
pulsing, driving, working.
powering the things we need
and the things we want.
pushing our daily advances.
pulling us into the future.

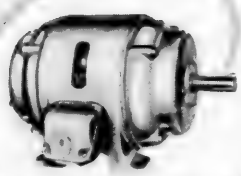
today our electric motors
are bigger and better.
they're also smaller and stronger,
surer and more powerful.

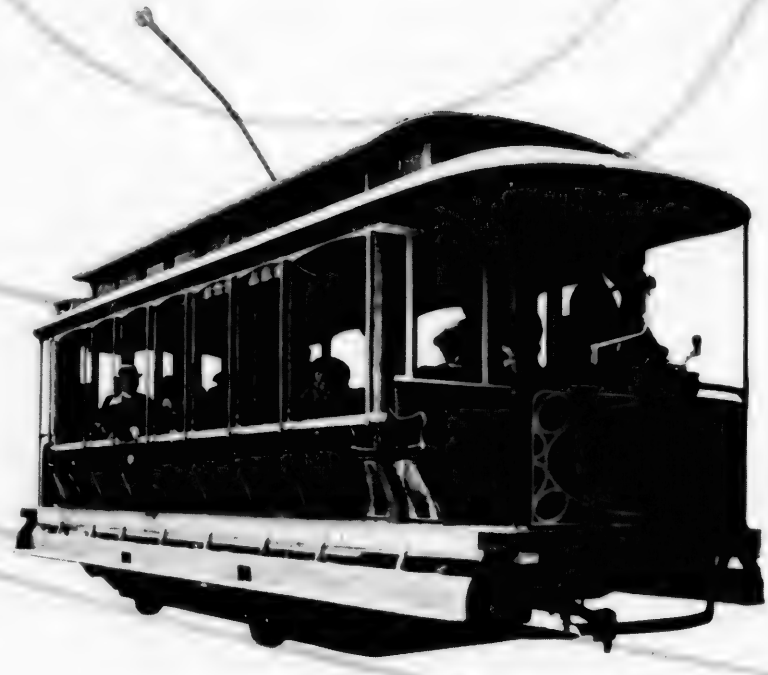
they operate in air and underground,
in freezing temperatures and underwater,
in gas-filled areas
and radiation atmosphere.

they power oil burners and compressors,
elevators and fans;
pumps, conveyors and saws.

they are adaptable
to every phase of every industry
for many reasons and more purposes.
they keep us growing
and they keep us improving.
they keep us ahead of the day before
and on the heels of the day ahead.

they are our heartbeats
and they run and they run and they run.





Fairbanks, Morse

A MAJOR INDUSTRIAL COMPONENT OF **FAIRBANKS WHITNEY CORPORATION**

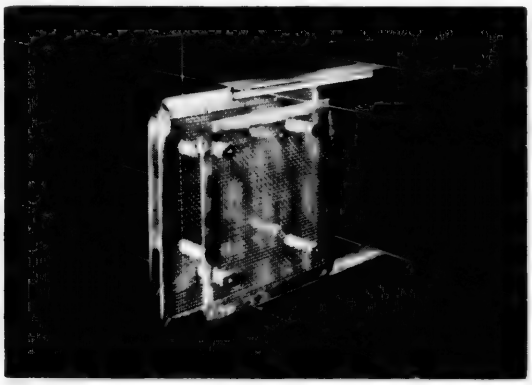
The electric motor is one of the most versatile sources of power ever developed. It is economical, practical and time-resistant. Fairbanks-Morse electric motors can turn out ½ horsepower or 10,000 horsepower, meet every known job demand within this range or be custom-specified to your blue-print projections. Whatever your production needs or plans may be, our electric motors can power them.

If you are in a field where power for production must be efficient, effective and dependable—we suggest that you consider our great variety of electric motors. For further information please write to: Mr. George H. Herrick, Vice President and General Manager, Electrical Division, Fairbanks, Morse & Co., Freeport, Illinois.

(Continued from page 107)

Disintegrates Dirt and Dust

Heart of the Statronic system engineered by CRS Industries, Inc., Philadelphia, Pa., is the high-voltage, statically charged screens shown in photo. Dirt and dust passing through this set of screens is shattered into particles so small that they remain suspended in the moving air. In addition, the air moving through the energy field becomes negatively ionized.



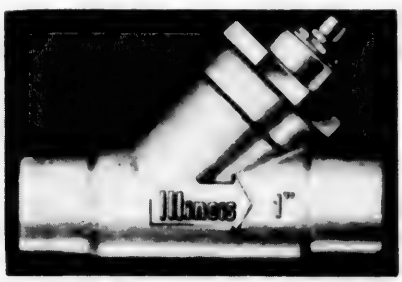
The bank of screens is installed in the return air duct of an existing air conditioning or heating system. A generator provides screens with static charge sufficient for a maximum of 10,000 cfm air flow. Airborne dirt and dust particles passing through are statically bombarded to a size well below 0.1 micron, so minute they become a permanent part of the atmosphere with little opportunity to settle, the company reports.

The system is currently being installed in the new Union Carbide Building, New York City, and is the method responsible for removing return air odors in theaters where the AromaRama process is installed. (See News of the Month, *Air Conditioning, Heating and Ventilating*, February, 1960.)

More information? Circle Item 57, postcard, last page.

Balancing and Shut-Off Valve

A combination balancing and shut-off valve with a built-in "memory" is introduced by American Air Filter



Co., Inc., Louisville, Ky. The Illinois valve takes the place of two valves normally used in series on the return line of a water coil, and competes favorably with the price of the two valves it replaces. Economies also are effected in installations with only one valve to be installed instead of two, the company reports.

Adaptable to almost any heating and cooling water application, the balancing and shut-off valve is said to enjoy extremely efficient balancing characteristics. The feature described as the "memory" allows the balance position to be fixed, and permits the valve to be closed and opened to the pre-determined balance point—but no further.

Differing from most balancing valves, this valve can be shut off absolutely tight, according to the firm, while also performing the balancing function, thereby eliminating the need for a gate valve in series. It is described as particularly suitable to applications involving cooling tower circuits with multiple condensers, air handling units, finned radiation, convectors, unit heaters, and zone units.

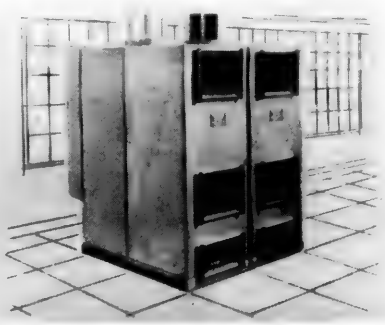
More information? Circle Item 58, postcard, last page.

New Type Air Scrubber

The Yerzley scrubber is an air pollution control device, introduced by Air Pollution Control Div., John Wood Co., Bernardsville, N. J., said to embody a new concept of operation and to represent a major reversal of thinking in the field.

Scrubber operates on the principle of interphase reaction, defined as an extraordinarily high, intimate contact through a wet-bed packing only a few inches deep maintained in a flooded condition. The technique is said to produce high absorption efficiencies in a very compact unit.

In application, the scrubber has been successful in removal of fumes from hydrochloric, sulphuric, nitric and



hydrofluoric acids; complex nitrogen oxides; alcohol; acetone; ammonium chloride; hot vegetable oils; sulphur compounds, hot grease vapors, and fine dusts.

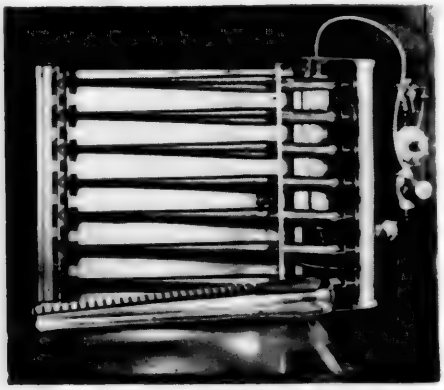
According to the manufacturer, the scrubber has been proved during years of field testing under the direction of its creator, Dr. Felix L. Yerzley. Inventor of various types of equipment, Dr. Yerzley is best known for the Yerzley oscillograph, which represented a major contribution to the testing technology in the rubber industry.

A brochure with description and specifications of the scrubber is available.

More information? Circle Item 59, postcard, last page.

Gas-Fired Duct Furnaces

A stainless steel burner which is reported to increase the burning efficiency of all types of gases is introduced in its DS Series gas-fired duct furnaces by Reznor Manufacturing Co., Mercer, Pa.



Featuring formed port burners with integral carryover, the new stainless steel burner is a universal unit for use with all types of gases, ranging in heating values from 500 to 3200 Btu per cu ft.

According to the company, burner's straight-line shape, which offers minimum turbulence or restriction, gives a high primary aeration coefficient, resulting in increased burning efficiency. Also contributing to its burning efficiency are the burner's slim profile and elongated port section, which allow a high secondary air entrainment.

More information? Circle Item 60, postcard, last page.

Air Velocity Meter

An air velocity meter, called the Gelman Wallac Thermo-anemometer, has been jointly developed by Gelman Instrument Co., Chelsea, Mich., and Wallac Company of Turku, Finland. This device accurately measures air speeds from 0.05 to 30 fps. It also measures air temperatures in two ranges: 30-110 and 50-250 deg F.

The Thermo-anemometer is compact and lightweight. It is composed of a directly calibrated meter-power unit

which is small enough to hold in use. Battery power is from a standard flashlight battery contained in the handle. The probe consists of a small metal cylinder in which 2 resistance wires are mounted. One of the wires is heated, the other cold. The two elements are arranged in a Wheatstone bridge circuit so that the cooling effect is a function of air velocity. Air temperatures can also be tested by flipping a switch to change from velocity to either of two temperature scales.

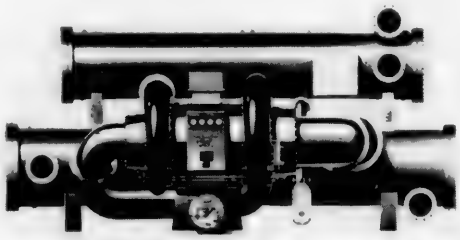
According to the manufacturer, the device has many uses in the laboratory and field. It can be used for checking face velocities at fume hoods for testing proper function. Air conditioning and heating engineers will find it useful for checking grille and duct air velocities and for tracing air currents. Meteorologists can use this air velocity meter for measuring low wind speeds up to 20 mph.

More information? Circle Item 61, postcard, last page.

Hermetic Centrifugal Chiller

A more complete line of CenTraVac hermetic centrifugal water chillers, which allows optimum selection for any air conditioning or process cooling requirement, has been announced by The Trane Co., La Crosse, Wis. The most economical selection for water chilling applications is now possible from the more than 150 CenTraVac motor-compressor-shell combinations available for capacities from 50 to 1,300 tons.

In increasing its number of available machines, the company has also simplified its selection procedure. The bulletin introducing this new line also introduces a new



method of presenting performance data which reduces selection time. Beginning with required tonnage and water conditions, machine selections may be read directly. It is no longer necessary to page through ratings for various machine sizes to locate the tonnage desired.

Compressor employs a two-stage balanced thrust design. It has pre-rotation vane capacity control ahead of each compressor stage. This results in a broad part load range from 10 to 100% capacity and efficient part load operation. The power requirement follows the output very closely.

The compressor is driven by a simple, constant-speed squirrel cage electric motor. The motor operates in the refrigerant atmosphere. There are no shaft seals to be maintained or to leak refrigerant.

Chillers have only one major moving part. This is the motor rotor on which impellers are mounted. There are only two bearings. Refinements made in the 1960 units include a lower over-all profile, reduced weight, fabricated water boxes, new instrument panel, and a redesigned purge unit.

More information? Circle Item 62, postcard, last page.

(Continued on page 112)

AMMONODUCT STEEL PIPE

for Championship Refrigeration

Architect:
Corlett and Spackman, A.I.A., and Kitchen and Hunt, A.I.A.
Mechanical & Electrical Engineers:
Vandament and Darmsted
Mechanical Contractor:
Gay Engineering Corp.
Pipe Jobber:
Monarch Piping and Engineering

Here, inside the magnificent Olympic Arena at Squaw Valley, 9,000 spectators thrilled to championship figure-skating and ice-hockey events at the 1960 Winter Olympics. And under the surface of the 85 x 190-ft rink Bethlehem steel pipe performed flawlessly, just as it will continue to do for years to come.

Nearly 11 miles of 1¼-in. Ammonoduct steel refrigeration pipe help create and support ice on the rink to a thickness of about one inch. Welded into 196-ft lengths and installed on 3½-in. centers, the pipe was connected to the 8-in. headers and 16-in. distribution mains (Bethlehem electric resistance-weld steel pipe), and embedded in a 5-in. concrete slab. The entire system was tested out at 150 psi.

Here's why steel pipe is specified by engineers as first choice for ice-rink installations: it can be fabricated cold without fracture, it is available in double-random lengths, and it costs considerably less than any other ferrous piping material. And because Ammonoduct provides top service for 20 years and longer, it's a favorite with contractors and builders as well.

Check today with your pipe distributor. Or call the nearest Bethlehem sales office.

Steel

for Strength
. . . Economy
. . . Versatility

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

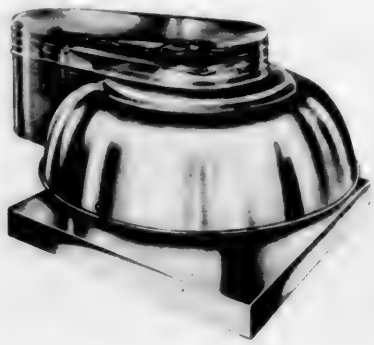
BETHLEHEM STEEL

(Continued from page 110)

Aluminum Power Roof Exhausters

Key Line is the name given to a new line of aluminum power roof exhausters manufactured by Jenn-Air Products Co., Inc., Indianapolis, Ind. Offered in both centrifugal (Series CK) and axial (Series AK) models, these units differ from conventional exhausters, the company states, in that the motor and drive assembly are mounted out of the air stream.

According to the manufacturer, the Key Line design has an extremely low contour—as much as 40% lower



than other exhausters of equal capacity. The smallest unit is only 20½ inches high; the largest only 33 inches high.

A deep bell mouth provides high efficiency, and circular discharge is unaffected by wind direction or velocity. Motor mounting is hinged to provide ready access for wiring. Pulleys are of heavy cast iron construction and are adjustable to permit speed variation. Belts have long drive centers and are equipped with an automatic tightening device to assure constant fan speed. Drive bearings feature permanently lubricated and shielded ball bearings.

Both the aluminum centrifugal wheel in Series CK and the steel axial blade in Series AK are dynamically and statically balanced. They are mounted on special vibration absorbers to provide quiet operation.

More information? Circle Item 63, postcard, last page.

Unique Bronze Branch Fitting

A bronze branch piping and tubing outlet, developed during the Korean hostilities to speed marine construction, is finding wide application in plumbing, heating, process piping and in other fields. The bronze socket brazing and threaded outlets, called Brazolets, were developed by Bonney Forge and Tool Works, Allentown, Pa., to help speed the installation of non-ferrous piping in non-magnetic minesweepers.

Designed for silver brazing to copper, brass or copper-nickel pipe or tubing, the Brazolet has a funneled inlet for improved fluid flow and a bonding surface at least three times the thickness of that of the pipe or tubing. The company claims that the fitting saves money, time and material in the fabrication of original installations and in the addition of outlets within existing systems.

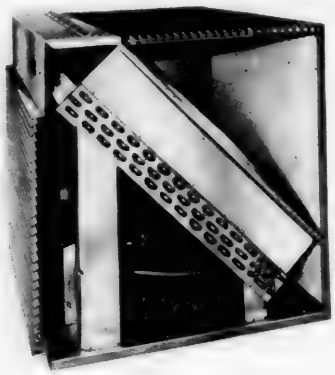
Unit price of the fitting is said to be less than that of other fittings, such as the reducing tee, and substantially less when the run pipe size exceeds 2 inches and the branch pipe is half the run size or smaller. Fabrication time is reduced because the run pipe can be installed in random lengths and the branch joints cut in afterwards. Unit fabrication cost is reduced because of less silver used and less heating.

Fittings are installed by cutting a hole in the run pipe with a drill or hole saw, fluxing the surface of the run around the hole as well as the bonding surface of the fitting, heating the joint to proper temperature and touching the silver brazing rod to the joint. The accuracy of the machined curvature at the base of the fitting provides for an instantaneous fully bonded joint that is stronger than the pipe to which it is attached, the company states.

More information? Circle Item 64, postcard, last page.

Outdoor Condensing Unit

A newly-designed Series 52 outdoor condensing unit is announced by Janitrol Heating and Air Conditioning Div., Midland-Ross Corp., Columbus, Ohio. Engineering changes include use of condensing coils of greater area, positioned diagonally in the cabinet for a more efficient arrangement of components. The larger coils are said to dissipate more heat and provide greater efficiency.



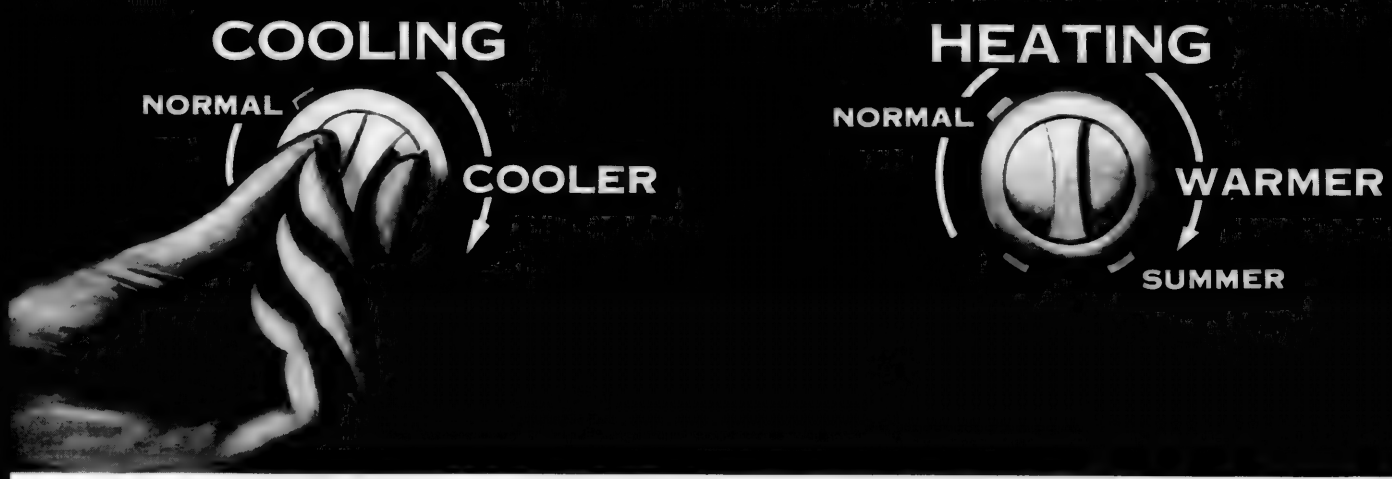
Unit's cabinet is of simple rectangular design and has a soft frost-green finish that blends harmoniously with any landscape plan. All exhaust air flows upward so that hot blasts do not affect nearby plantings. Cabinet design permits any desired number of the units to be installed side-by-side with zero clearance between. This provides an economical method of obtaining a variety of high-capacity cooling combinations through the use of standard models.

Unit operates when outside temperatures are as high as 125 deg F. It is available in capacities from 22,200 to 110,200 Btu per hr.

More information? Circle Item 65, postcard, last page.

(Continued on page 114)

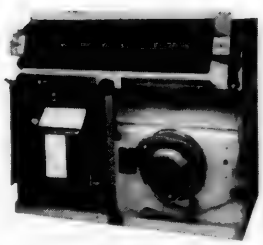
A WEBSTER NEWPORT IS ALL YOU NEED TO CONTROL



THE CLIMATE IN ANY ROOM!

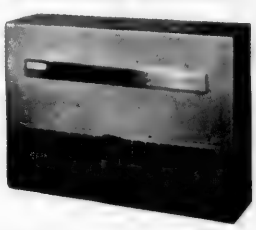
Because each Webster Newport with *self-contained* cooling cycle provides a *complete* system for both heating *and* cooling. There's no elaborate—and costly—central system for the cooling cycle required with this truly modern concept in year-round air-conditioning. The turn of a knob on the Webster Newport gives complete control of room temperature at any time—day or night, summer and winter. Heat one room while you cool another . . . you control the climate in *every* room equipped with a Newport.

Self-contained design features of the Webster Newport can mean important cost savings, too. Attractive in-wall units can be installed a room at a time, as budget limitations permit—and *without* disrupting service throughout the building. Air-conditioning of the entire structure can be completed at savings up to 30% as compared to central system type installations. Units are easy to install . . . connect readily to existing heating systems, or—with the new all-electric model—tie in with present electrical circuiting. Let a Warren Webster man spell out the advantages the Webster Newport can mean for your specific requirements.



COOLING BY CHRYSLER AIRTEMP

EQUIPPED WITH CHRYSLER'S HEAVY-DUTY COMMERCIAL COOLING CHASSIS



WARREN WEBSTER & COMPANY, INC.

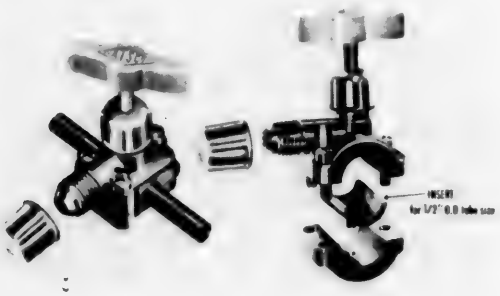
HEATING • COOLING

CAMDEN 5, NEW JERSEY

(Continued from page 112)

Adjustable Line Tap Valves

Cited as incorporating many new and useful advantages, two adjustable line tap valves are introduced to the refrigeration and air conditioning industry by Watsco, Inc., Hialeah, Fla. These AP-1 and AP-2 valves are easily attached to refrigerant lines for piercing the tube to provide a port for testing, charging, discharging or purging.



Among the features are a needle that cannot loosen and fall out; a handle made of "Delrin"; modern design and smooth finish; and the fact that all sizes of tubing from 3/16 to 5/8 inches can be serviced with just these two valves.

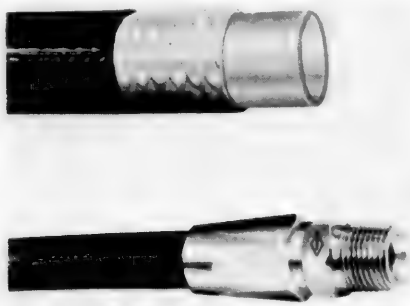
Valves are attached to tubing from the top by means of Philips screws to facilitate installation. For additional protection against leakage, each valve incorporates an additional sealing cap to fit over the charging port.

More information? Circle Item 66, postcard, last page.

Synthetic Pressure Hose

Hytron pressure hose, of all synthetic construction for hydraulic and other high pressure applications, is offered by The Imperial Brass Mfg. Co., Chicago, Ill.

Hose consists of a seamless extruded inner tube of special virgin polyamide material, a high-tensile-strength polyester reinforcement, and a cover of extruded polyamide formulation. Cover is black and is fluted for added torsional strength.



Minimum burst pressure is listed as 9,000 to 12,000 psi, depending on size. Temperature range is from minus 40 to 225 deg F.

A complete line of reusable couplings is provided for assembly of hose, and hose assemblies can also be furnished with factory crimped-on couplings.

Among the advantages listed for the hose are: far smaller OD than rubber hose for equivalent pressure and ID size, up to seven times the flex-fatigue resistance of wire braid rubber hose, 60% lighter in weight, available in long lengths (up to 1100 feet on some sizes), unaffected by hydraulic fluids, flammable or non-flammable, unlimited shelf life—non-aging, no restriction of ID with age, and up to 2½ times as much abrasion resistance.

Applications include hydraulic lines, hot paint lines, solvent lines, freon lines, fuel and oil lines, high pressure pneumatic service, high pressure carbon dioxide and oxygen lines and others.

More information? Circle Item 67, postcard, last page.

Thermoelectric Experimental Kit

Coincident with the introduction of Neelium, a new semiconductor alloy claimed to have the highest efficiency of any thermoelectric material and the first to be commercially available in mass production quantities, is the announcement by General Thermoelectric Corp., Princeton, N. J., of the marketing of an experimental kit especially designed for the study of basic thermoelectric principles.

According to the company, the basic unit in the experimental kit is a thermoelectric module known as a Frigistor, consisting of eight thermocouples fabricated from Neelium. The module can be used in applications such as modifying existing products or designing new devices centered around thermoelectric heating or cooling.

The kit contains all of the necessary tools for thermoelectric cooling experimentation, including the Frigistor module; two fin assemblies, one for use at the hot junction for heat dissipation, the other suitable for mounting transistors which require cooling; a single Neelium thermocouple; a heat-conductive adhesive; a special insulating material; a suitable power supply; and a booklet to be used as a guide in calculating hot and cold junction temperatures and heat pumping capacities.

The package is described as an excellent medium for research centers, laboratories, and other scientific groups engaged in applied research or broad experimentation. In addition, it lends itself readily to use by schools and colleges for educational and demonstration purposes.

More information? Circle Item 68, postcard, last page.

(Continued on page 116)

Easily-installed PPG Neoprene-coated Duct Liner now meets fire requirements, provides extra margin of safety on ductwork installations.

NOW—PPG Fiber Glass Duct Liner Carries the UL Label

PPG Neoprene-Coated Superfine Duct Liner Meets All Requirements of NBFU Bulletins No. 90-A and 90-B for Ducts

YOUR ASSURANCE OF SAFETY

PPG is proud to announce that its Neoprene-coated Superfine Fiber Glass Duct Liner has been thoroughly tested according to the condition determined by National Board of Fire Underwriters, and has met the Board's rigid safety requirements in compliance with Bulletins No. 90-A and 90-B for ducts. It now bears the label of the Underwriter's Laboratories, Inc.

For you, this means that PPG Neoprene-coated Fiber Glass Duct Liner meets fire requirements and provides that extra margin of safety on any ductwork installation.

PLUS ALL THOSE EXTRA PPG ADVANTAGES...

. . . such as lightweight, easy handling, easy cutting and piecing, low wastage, fast installation, fine acoustical qualities, good thermal barrier characteristics, low resistance to air flow, no air erosion; and lifetime service, because it won't rot or decay, is not affected by humidity or dryness.

Give PPG Fiber Glass Duct Liner a try. It offers you a combination of top-flight insulation and economy. For full information, call your nearest PPG Fiber Glass Sales Office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

Sales Offices: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Fort Wayne, Houston, Kansas City, Louisville, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis and Washington.

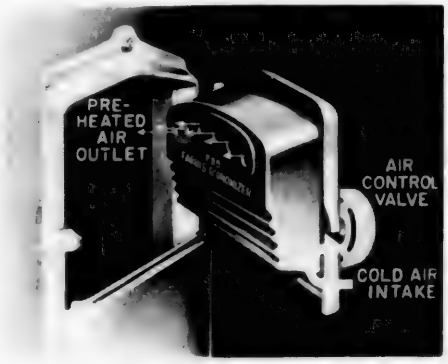
FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

(Continued from page 114)

Fuel Economizer Offered

A fuel economizer, said to be capable of saving up to 25% of fuel cost and reducing smoke to a practical minimum, is in production at Farris Combustion Controls Corp., Palisades Park, N. J.

The unit injects preheated secondary air over the furnace or boiler fire. The preheated air (up to 700 deg



F) creates a hotter fire which results in more complete combustion of fuel and a minimum of smoke, soot and other waste products of unburned fuel, the company states.

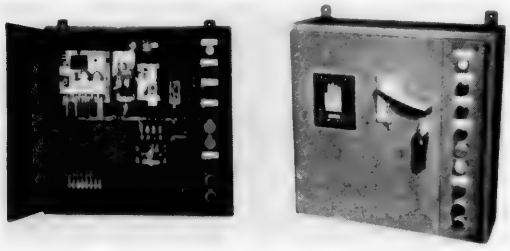
Economizer mounts inside any furnace or boiler fire door. It does not require any fuel, power or maintenance and can be used with high- or low-pressure boilers firing oil, coal or coke.

Unit was developed during World War II to conserve fuel and to minimize a ship's smoke, which often revealed a convoy's position to the enemy. It was found that the way to reduce smoke was to burn fuel completely.

More information? Circle Item 69, postcard, last page.

Heating Control Panels

A series of packaged Protectal control panels, for automatic *start*, *stop*, and complete combustion *supervision* of gas-fired ovens, furnaces, boilers, and various heating and heat-treating systems, is offered by Protection Controls, Inc., Skokie, Ill. Packaging of standard com-



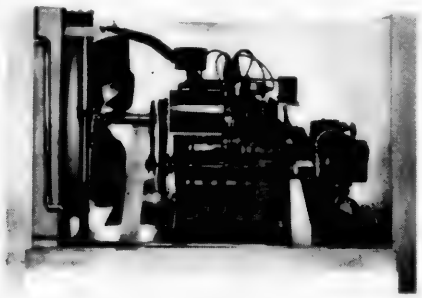
ponents and assemblies results in lower costs because of the wide range of single and multi-burner heating installations that can be accommodated without additional engineering, the company says.

Basic panel includes the following: (1) Starter for 3 hp motor, (2) Circuit breaker interlocked with access door, (3) Company's Protectofier combustion safeguard which automatically shuts down system if flame fault or failure occurs, (4) Control circuit transformer for 115-v operation, (5) Adjustable purging timer, (6) Electric ignition transformer (or, an automatic igniter control unit is available for multi-burner installations), (7) Audible alarm, (8) Selector and push-button switches, (9) Indicator lights, and (10) Steel, dust-tight enclosure.

More information? Circle Item 70, postcard, last page.

Gas-Powered Air Conditioning

Development of natural gas or LP gas powered air conditioning systems for residential and institutional use is announced by Gas-cool Div., Vector Engineering Contractors, Inc., Dallas, Tex. Models currently available are 5-ton and 7½-ton capacities with optional carbure-



tion for use with natural gas or LP gas. Operating costs are said to be as much as 61% less than comparable all-electric systems.

The average fuel requirement is 20 cu ft of 1,000-Btu natural gas per ton-hour of operation. LP gas fuel consumption is less than 1/5 gal per ton-hour. At 100 deg F ambient temperature, the 5-ton models have a rated capacity of 60,000 Btu per hr at 40 deg F suction and 68,500 Btu per hr at 45 deg suction. The 7½-ton models have a rated capacity of 90,000 Btu per hr at 40 deg suction, 100,000 Btu per hr at 45 deg suction.

Units are powered by a Continental engine developed under the PAR program of American Gas Association. It is factory-tested to produce 10,000 hr of trouble-free operation before any major overhaul repairs are needed, the company asserts.

Systems are easy to install, either outdoors or roof mounted, requiring two simple connections to cooling coil in the duct system. Single-phase electric service suffices; engine starting requires standard 230-v, 20 amps.

System has automatic thermostatic temperature control. Extremely low operating noise level is said to be due to design of the glass fiber insulated cabinet and muffler installation. In addition, four moulded neoprene rubber vibration dampeners are installed between engine-compressor assembly and the steel base for quieter and smoother operation.

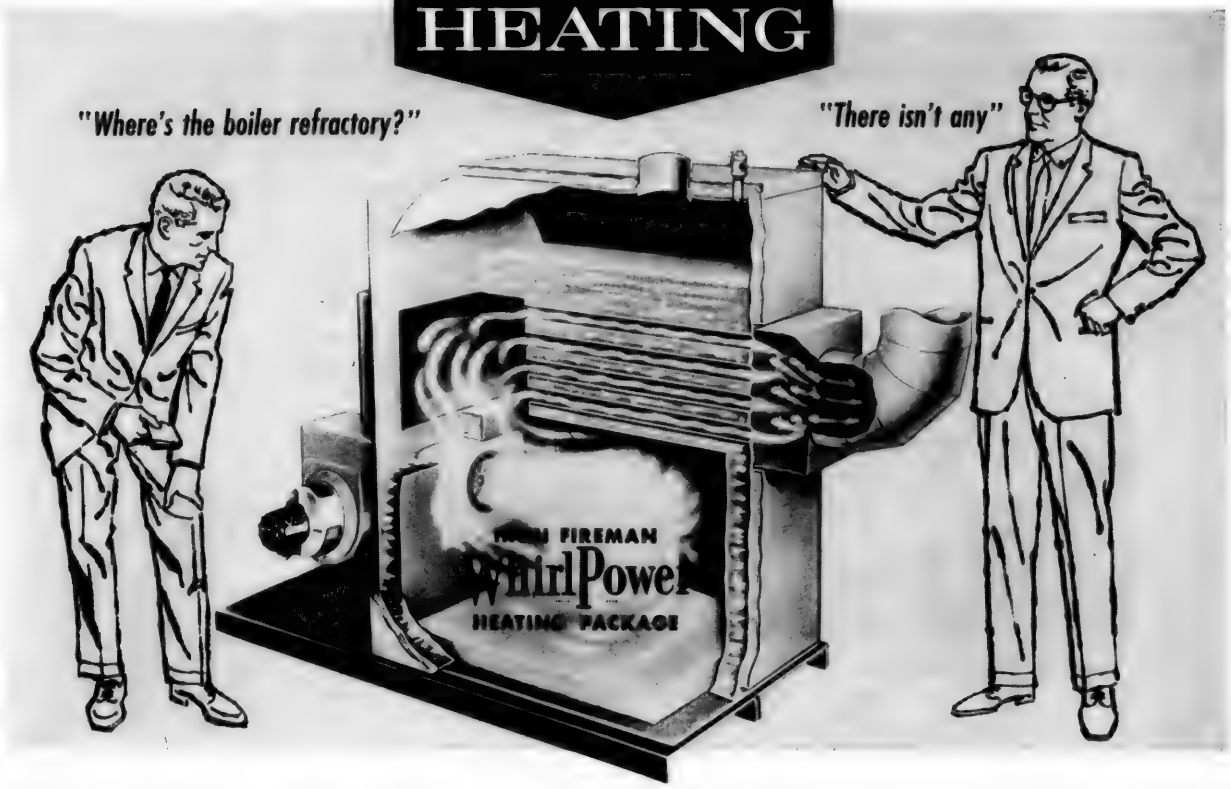
In addition to the 5-ton and 7½-ton models, 10-ton, 12½-ton and 15-ton models will be available soon.

More information? Circle Item 71, postcard, last page.

(Continued on page 118)

The new world of

HEATING



CLEAN FLAME *within seconds* FROM COLD START

No hot refractory needed to support combustion

The new WhirlPower heating package makes a clean flame in a cold firebox, because it does not depend for its combustion efficiency on the reflected heat of hot refractory. All conditions for *complete* combustion are created *within the fire-cone itself*. It starts clean and stays clean.

Whether firing oil or gas, the entire air supply is introduced through the firing port, under forced draft, into a sealed combustion chamber. Fuel and air are combined within a firing head of new and unique design. Since firebox pressure remains constant (unaffected by the uncertainties of natural draft) the air volume can be as accurately metered as the fuel supply.

Exceptional economies in fuel and maintenance

Iron Fireman WhirlPower combustion eliminates many causes of service. Most service calls result from sooted flues, fouled electrodes, dirty combustion controls, or by carbon-clogged nozzles, baked by the reflected heat of hot refractory. The considerable cost of refractory maintenance is also eliminated. With a high resistance to the passage of air through burner and boiler, and no draft-producing stack, standby losses are reduced to a minimum. This, plus high combustion efficiency, results in substantial fuel savings.

No stack needed; merely a vent

Forced draft and sealed combustion makes a high stack unnecessary. Only an exhaust vent or stub stack is needed, and this can be a third smaller than the usual flue diameter.

For gas, oil or dual-fuel firing—steam and hot water models

Single fuel models are available for either gas or oil. Dual-fuel models switch fuels instantly, either under manual or automatic control.

Mail coupon for full information and specifications

IRON FIREMAN

HEATING AND AIR CONDITIONING
AIRCRAFT COMPONENTS AND EQUIPMENT
MISSILE AND AIRCRAFT GYROSCOPES
ELECTRONIC EQUIPMENT
CONTROL INSTRUMENTS

Iron Fireman Mfg. Co., 3086 W. 106th St., Cleveland 11, Ohio
(In Canada, 80 Ward St., Toronto)
Please send full information and specifications on the WhirlPower Heating Package.

Name _____

Firm _____

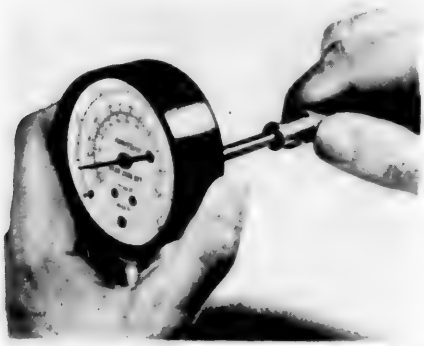
Address _____

City _____ State or Prov. _____

(Continued from page 116)

Gage Has External Zero Set

A quick turn of a screwdriver recalibrates the new refrigeration gage with external zero set, announced by United States Gauge Div., American Machine & Metals, Inc., Sellersville, Pa. This specially designed gage will serve as a basic test instrument for refrigeration service work.



Company's Frostline refrigeration gages are said to be particularly desirable where rugged construction is needed to withstand occasional over-pressures, sharp blows and falls. Such mishaps may result in a gage showing an off-zero reading, when not in use, and a corresponding error when being used for testing.

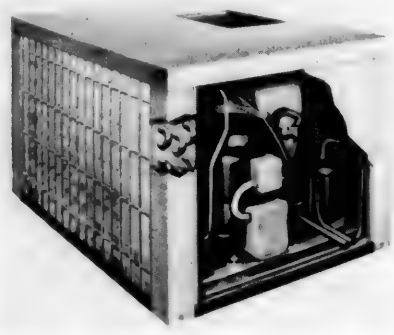
To restore indicating accuracy, gage incorporates a device for resetting the pointer at zero, correcting up to 30% of scale. The recalibration is easily accomplished with a screwdriver, from the back of the gage, without removing gage ring or crystal.

More information? Circle Item 72, postcard, last page.

Waterless Condensing Unit

A line of remote waterless condensing units, Type 938, in 3-, 4-, and 5-ton nominal sizes for installation with coil and cabinet or air handling units is announced by Mueller Climatrol Div., Worthington Corp., Milwaukee, Wis.

Design includes large, extra-capacity centrifugal blower



to insure quiet and dependable operation under any climatic condition. All controls, other than thermostat, are located inside the condensing unit and all parts are easily accessible for installation and service.

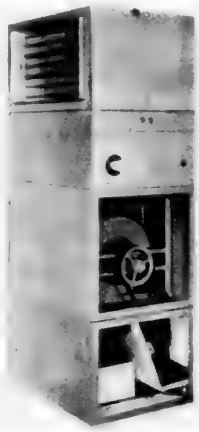
Units are weather-proofed against the elements for outdoor installation in any climate. Raised base and undercoating prevent rust and insure long life.

Controls, receivers, and many other parts of the condenser package are standardized to minimize stock problems. All units are shipped assembled, pre-charged with refrigerant and pre-wired. All units are rated in accordance with ARI standard 210-58.

More information? Circle Item 73, postcard, last page.

Auditorium Unit Ventilators

A new line of heating and ventilating units for use in auditoriums, gymnasiums, and other large area rooms is announced by Schemenauer Manufacturing Company, Holland, Ohio.



Tradenamed Acousti-Vent, these unit ventilators are presently offered in sixteen sizes. They range from 1250 to 15.000 cfm and deliver air at up to 1¼ inches of external static pressure, water gage.

According to the manufacturer, the units have unique acoustical chambers which result in extremely quiet operation.

Units are for use with hot water or steam heating systems. They may be installed in either horizontal, vertical. or inverted position. (Photo shows unit in the inverted position.)

A catalog of heating and ventilating units, No. 1061, is available. It contains all necessary selection data.

More information? Circle Item 74, postcard, last page.

Insulation Storage Simplified

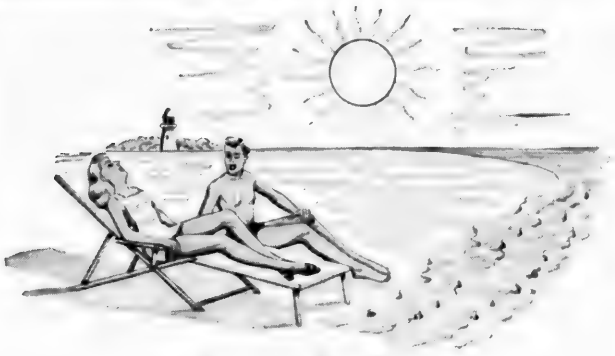
The labor and expense necessary to store insulation materials for large jobs have been eliminated through the introduction of weatherproof cartons, states Johns-Manville, New York, N. Y. J-M weather-proof insulation cartons have been tested to withstand exposure to snow and rain for a period of three months without damage to contents.

Availability of these cartons can make it possible for users of J-M insulations to eliminate the cost of erecting or renting jobsite storage facilities, thus reducing the installation costs on large or long-term jobs. Only runners or skids are recommended to keep cartons off the ground or out of standing water.

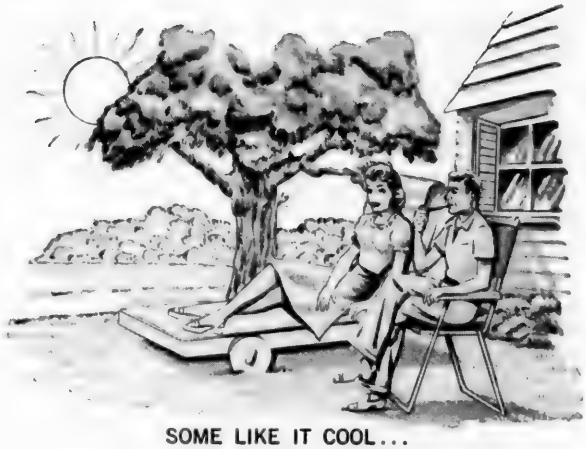
Most of J-M's industrial and commercial insulations, including high temperature pipe and block, will be available in weatherproof cartons at a slight premium.

More information? Circle Item 75, postcard, last page.

(Continued on page 120)



SOME LIKE IT HOT...



SOME LIKE IT COOL...

AGITAIR® solves these air distribution problems

with the

TRULY ADJUSTABLE Diffusers

AGITAIR®

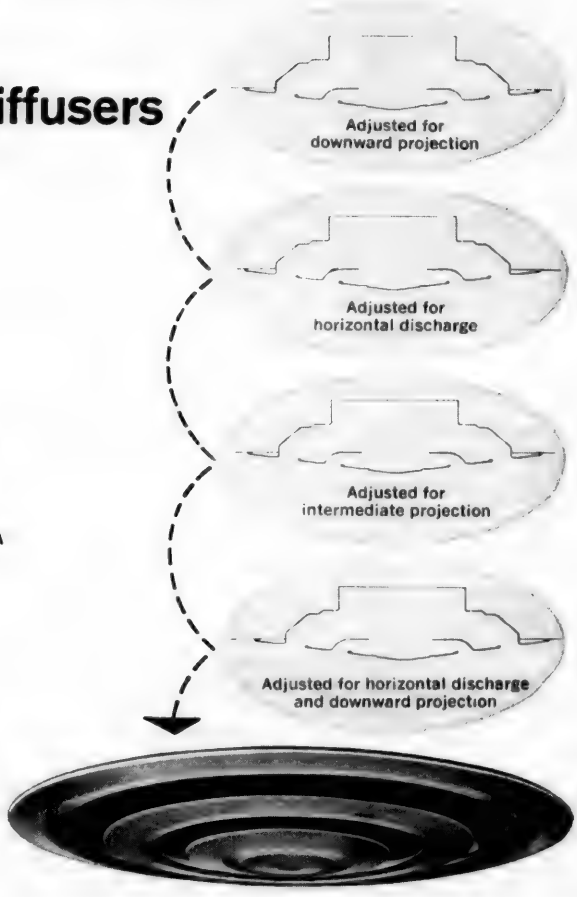
TYPE "OA"

With the distinctive AGITAIR "finger-tip control" you can adjust the air stream toward or away from any occupant to take care of all conditions.

AND—all air stream adjustments are made after the type OA has been installed without raising or lowering the spinnings. AGITAIR eliminates any uneven appearance to the ceiling line.

Every feature of AGITAIR circular diffusers has been designed to assure complete user satisfaction... appearance ... performance... noiseless, draftless air distribution—and the type OA is definitely easier to install.

For complete engineering data on these AGITAIR circular diffusers, ask your AGITAIR representative for catalog C-101 or write direct to Air Devices Inc.


Adjusted for downward projection
Adjusted for horizontal discharge
Adjusted for intermediate projection
Adjusted for horizontal discharge and downward projection

AGITAIR®

GENUINE PRODUCTS
FOR BETTER AIR

high velocity units . . . air diffusers . . .
registers-grilles . . . filters . . . exhausters

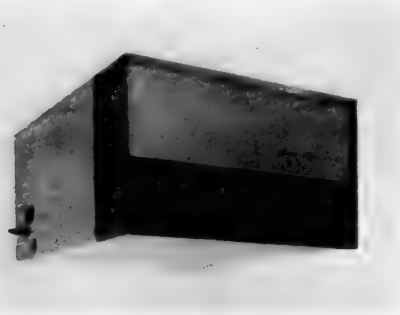
AIR DEVICES INC.
185 MADISON AVENUE, NEW YORK 16, N.Y.

(Continued from page 118)

Six-Ton Split-System Conditioner

Introduced by General Electric Co., Tyler, Tex., is a 6-ton split-system air conditioner.

This addition to the G-E air conditioner line includes a weatherized outdoor remote unit, Model TA75B3, and an indoor air handling unit, Model TE72BH, illustrated. It is U.L.-approved and rated in accordance with ARI Standards, the company reports.



Concurrent with the announcement of its 6-ton conditioner, a spokesman reaffirmed the company's warranty policy. This provides protection to the end-user through a standard one-year coverage on the entire air conditioner, plus a four-year warranty on the compressor alone. No replacement labor allowance is included.

More information? Circle Item 76, postcard, last page.

Universal Indicating Transmitter

A line of pneumatic indicating transmitters for pressure, flow, temperature, liquid level, differential pressure, and dew point has been introduced by The Foxboro Co., Foxboro, Mass.

Known as the Model 45 Series, the line's measuring elements are designed for each major process variable. The transmitter is available with measuring elements in the following ranges: *Pressure*—0-10 inches water to

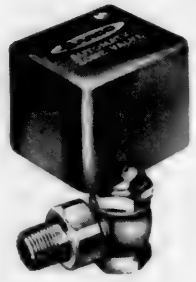
0-80,000 psi; *Temperature*—minus 450 to plus 1000 deg F (minus 270 to plus 500 deg C); *Flow (differential pressure)*—0-1 to 0-400 inches of water; *Liquid level*—open vessels 0-10 inches of water minimum; closed vessels, 0-20 inches of water minimum; *Dew Point*—minus 50 to plus 165 deg F). Output signal: 3-15 psi (3-27 psi optional). Operates on a 20-psi air supply.

According to the company, unit has high ambient temperature stability, with less than ½% error for ambient temperature changes as great as 50 deg F, regardless of the variable measured. This stability is accomplished by careful matching of measuring elements and transmitter units. Overall calibrated accuracy of the transmitter, including measurement and output signal, is guaranteed to be within plus or minus ½%.

More information? Circle Item 77, postcard, last page.

Automatic Zone Valve

An automatic valve, called Type ZV, for zone control of hot water, steam and radiant heating systems, is announced by Sarco Co., Inc., New York, N. Y.



According to the manufacturer, this automatic zone valve is designed for heating and cooling applications utilizing fan-coil units, thereby providing inexpensive individual control of room temperature. Operating on 24 volts a-c, the device features a thermostat-actuated valve that responds to temperature demand, and simultaneously controls the operation of circulator or burner.

Other reported advantages are rugged construction, silent operation, tight shut-off, easy access to mechanism, standby manual operator, position indicator, and availability of master unit.

More information? Circle Item 78, postcard, last page.

Indoor Cooling Towers

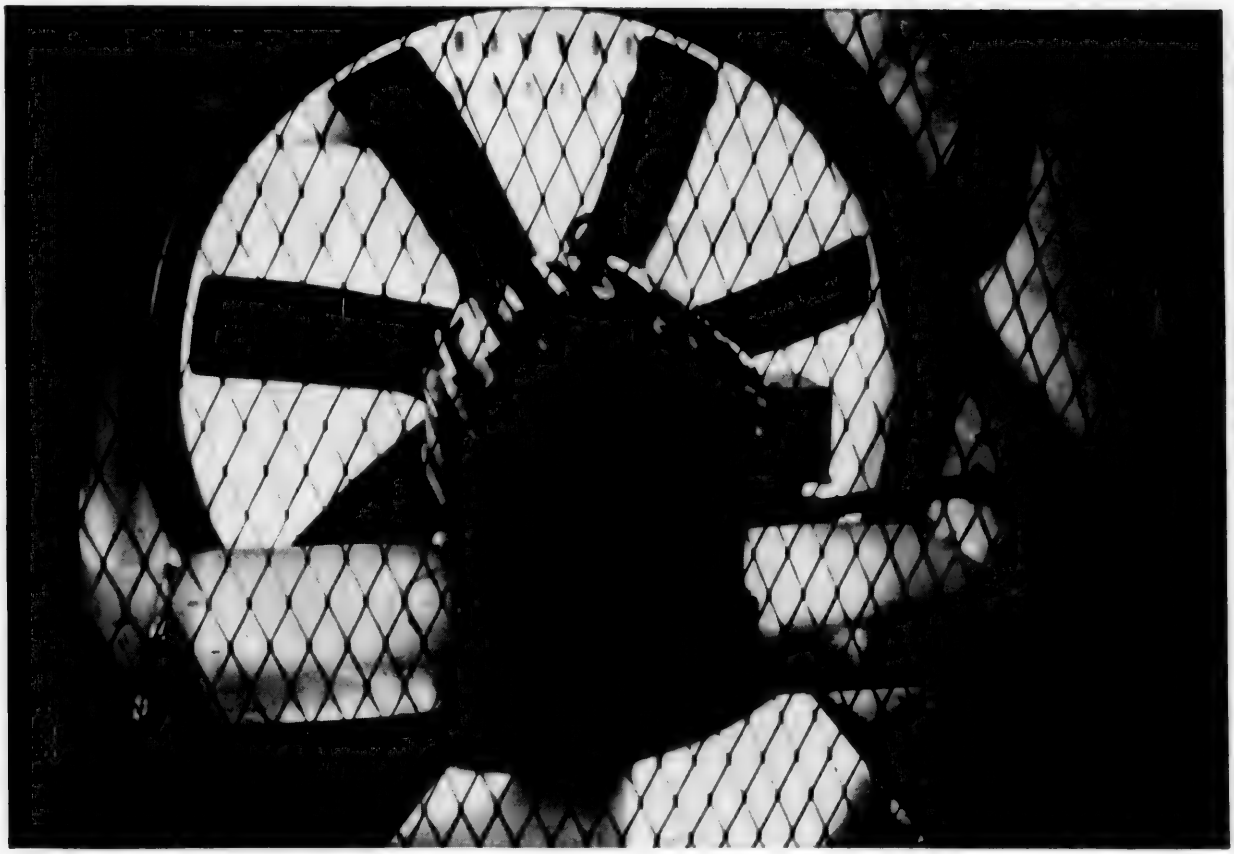
Three new models have been added to the line of AquaCoolers manufactured by The Marley Co., Kansas City, Mo., extending the number of models to 14 with a top nominal capacity of 90 tons.

These indoor cooling towers have undergone major redesign in the past six months. Marley claims for them increased installation adaptability due to interchangeability of casing panels, selectability of air intake and air discharge direction, and multiple choice of hot water inlet and suction connection locations. Smaller models are designed to pass through standard 30-inch doorways without disassembly; larger models are designed for easy, quick disassembly if necessary.

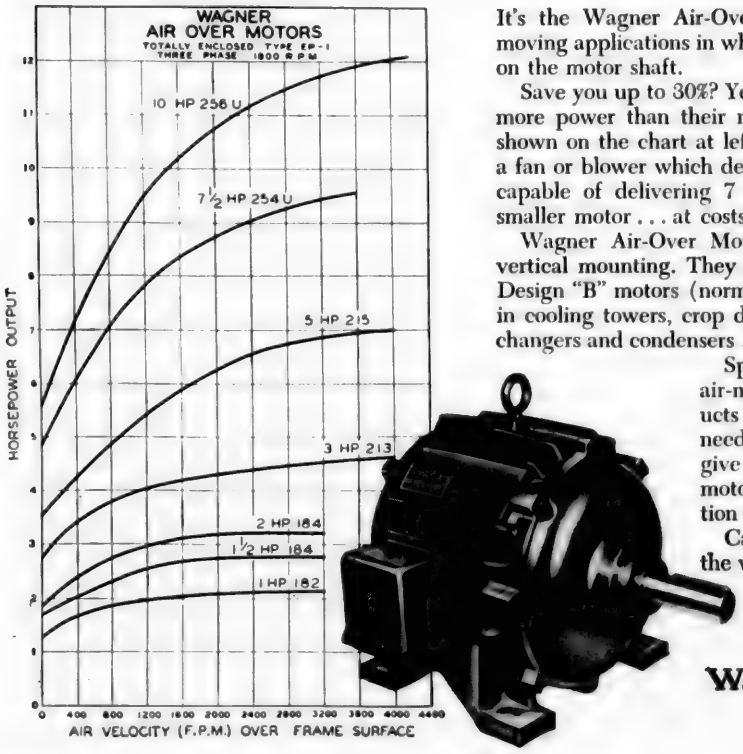
All models feature quiet operating centrifugal blower type fans, balanced spray nozzle water distribution system, and close-packed filling for maximum air-water contact.

More information? Circle Item 79, postcard, last page.

(Continued on page 122)



This Wagner Motor can save you up to 30% in costs on air-moving equipment



It's the Wagner Air-Over Motor . . . *specifically* designed for air-moving applications in which a propeller or axial flow fan is mounted on the motor shaft.

Save you up to 30%? Yes, for Wagner Air-Over Motors can deliver more power than their rated horsepower output. For example, as shown on the chart at left, a 5 horsepower rated motor installed in a fan or blower which delivers about 4,000 feet of air per minute is capable of delivering 7 horsepower. You get more work from a smaller motor . . . at costs up to 30% less.

Wagner Air-Over Motors are suitable for either horizontal or vertical mounting. They are totally-enclosed, nonventilated NEMA Design "B" motors (normal torque—normal slip). You can use them in cooling towers, crop dryers, exhaust systems, air-cooled heat exchangers and condensers . . . any air-over fan and blower application.

Specify Wagner Air-Over Motors for all your air-moving equipment applications. Your products will operate at peak efficiency for years, need less service and fewer repairs. And, you'll give your customers equipment powered by motors they know . . . motors that have a reputation for long, dependable service.

Call your Wagner Sales Engineer now . . . get the whole Wagner Air-Over Motor story. There are Wagner Branches in 32 principal cities across the country.

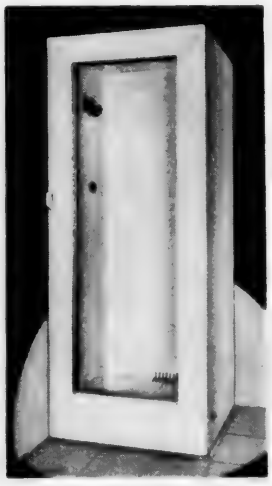
Wagner Electric Corporation
6463 Plymouth Ave., St. Louis 33, Mo.

WH60-13

(Continued from page 120)

Maximum Security Stall Shower

A maximum security stall shower unit, Hono Model S-60, is announced by Super Secur Showers, Inc., Burlingame, Calif. It is said to satisfy the need existing in prisons, jails, and other institutions for a completely tamper-proof, unbreakable unit.



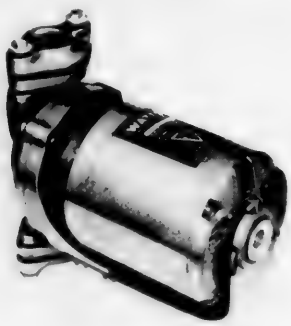
Unit is made of ¼-inch aluminum plate with cast aluminum receptor and rear outlet drains, and is furnished to job site completely assembled and equipped with tamper-proof head, valve, and soap dish and clothes hook, all welded in position. Exposed surfaces are painted white or pastel colors.

The stall shower unit is designed to withstand continual punishment, the company says, and its use eliminates the maintenance costs that are due to breakage. It is said to be the only product of its kind on the market.

More information? Circle Item 80, postcard, last page.

Circulator, Hydronic Accessories

A circulator for forced hot water heating systems that is said to be unusually quiet and compact is announced by Watts Regulator Co., Lawrence, Mass. Designated Type 1000, the circulator underwent extensive laboratory and field tests, according to the company, and includes many unique design features.



The pump impeller is attached directly to the motor shaft, eliminating the need for a pump bearing bracket assembly, a separate shaft and a coupling, described as common sources of mechanical trouble. Company expects this feature to reduce maintenance to a minimum and to assure quiet operation, and also credits the circulator's compactness to it. Measuring 11¼ inches long by 9¼ inches high, the circulator is said to be well-suited to today's small boilers and utility rooms.

To complement the circulator, Watts has also introduced a line of hydronic accessories: a combination air eliminator with flow check (both contained in one casting for easier installation), air eliminators, an exclusive four-in-one tank drain, two-way flow checks (angle or horizontal) and radiator diversion fittings. These join such related products as feed water pressure regulators, tempering valves, and ASME safety relief valves, so that the manufacturer now offers a complete selection of controls for hydronic systems.

More information? Circle Item 81, postcard, last page.

Enters Electric Heating Field

Electric warm air furnaces, packaged heat pumps, and split-system heat pumps for residential and light commercial applications are introduced by American-Standard Air Conditioning Div., New York, N. Y. These products mark the entry of the firm into the electric heating field.

The new electric furnace, at right in photo, is a factory assembled and wired unit of 24kw (82,000 Btu) heating capacity. Simple re-connection of electric hookup can reduce the capacity by steps down to 41,000 Btu to meet precise home heating requirements. The furnace is available in both upflow and downflow models. Two blower capacities are available to handle up to 5 tons of add-on air conditioning.

The packaged heat pump, at left, is designated as Model ACPR and is available in two, three and four horsepower capacities. The split system model consists of Model AC-BR, outside unit, and Model RC-BR, inside unit. Split system heat pumps are available in 3- and 5-hp capacities.

Both the split system and packaged heat pumps provide for completely automatic heating and cooling by single thermostat control. Both are equipped with an automatic de-icing system. A supplementary electric heater is available in four heating capacities from 4 through 16 kw to provide additional electric resistance heating as necessary.

More information? Circle Item 82, postcard, last page.

(Continued on page 124)

Photo courtesy of Turner Construction Company

Built to an "Only the Best" specification

. . . equipped with JENKINS VALVES

The Interchurch Center
New York City

Poised on a bluff 100 feet above the Hudson River, this $21 million structure houses 2,000 individuals representing [illegible] Protestant and Orthodox communions, embracing 40,000,000 members in the United States. Its imposing limestone facing above represents a substantial investment in beauty as well as permanence.

Architects Cobb, Frost, White & Brogger; Voorhees Walker Smith Smith & Haines; *General Contractor* Turner Construction Company; *Plumbing Contractor* [illegible]; *Heating Contractor* Rust Engineering Company

Jenkins Iron Valves on water lines of condensor

A magnificent culmination to a fifty-year dream of bringing Protestant and Orthodox communions in America together under one roof, The Interchurch Center is an outstanding New York building, as well. It is especially noteworthy for an overall high quality in construction and equipment. Planned to be a symbol of unity that would endure for generations, architects and contractors could be satisfied only by "the best" in everything.

When it came to valves for both the central air conditioning system and the heating system with its three low pressure boilers, all building factors agreed on JENKINS. They could be sure Jenkins Valves would deliver an unusual measure of long-time efficiency and economy. And, as practical planners, they appreciated the fact that Jenkins Valves cost no more than any good valves.

When YOU choose valves, remember that you pay no premium to specify the valves so often favored by the country's top building authorities. Jenkins Bros., 100 Park Ave., New York 17.

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

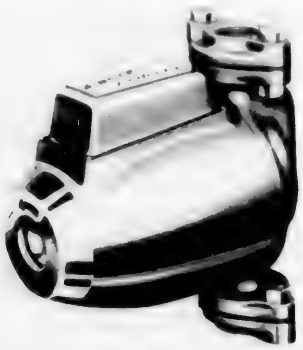
JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS SINCE 1864 Jenkins Bros.

(Continued from page 122)

Hot Water Circulators

The newest addition to its Perfecta line of hot water circulators is announced by Taco Heaters, Inc., Cranston, R. I. Like other circulators in this line, the company reports, Model 152 incorporates design features which assure trouble-free performance.

For example, there are no seals to leak, wear or create



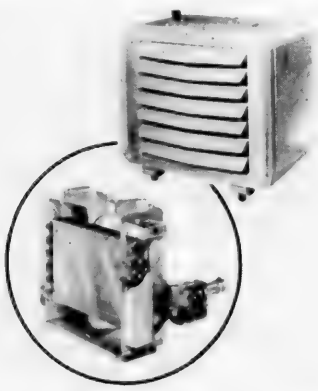
extra friction, and no drive couplings. Impeller, rotor and shaft are assembled as a single unit. Circulator is water lubricated and is said to require far less power than ordinary models.

The streamlined circulator mounts easily in spaces where many conventional circulators cannot be installed, and is well suited for packaged boiler units. It is available with ¾, 1 and 1¼-inch interchangeable flanges.

More information? Circle Item 83, postcard, last page.

Electric Unit Heaters

A stainless steel finned sheath heating element is the heart of a line of heavy-duty electric fan-forced unit heaters for industrial, commercial and retail establishments introduced by Markel Electric Products, Inc., Buffalo, N. Y.



Capacities of these Unit Heetaires (Series 600) range from 2 to 10 kw with 208, 240, 480 and 575-volt single and three-phase types, with either built-in or remote thermostat controls. Units are either suspended from the ceiling, or wall, or they may be used as portables.

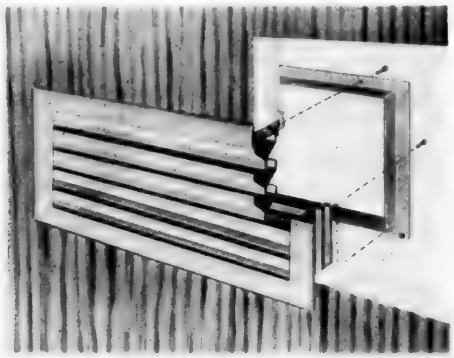
Elements consist of helically-coiled, nickel-chromium alloy resistance wire imbedded in magnesium-oxide, enclosed in stainless steel sheaths to which are permanently braised stainless steel fins.

Accessory thermostats, contactors, and ceiling and wall mounting brackets give the users a complete selection for every application. Heaters are Underwriters Laboratories and CSA approved.

More information? Circle Item 84, postcard, last page.

Extruded Aluminum Door Louver

The C/S Door Louver is a new extruded aluminum unit with features of particular usefulness for hospitals, sanitariums, and other such installations where cleanliness of



facilities is of major importance. Sight-proof, light-proof, and sound-proof models are available.

This louver, introduced by Construction Specialties, Inc., Cranford, N. J., is said to be unique in that it can be repeatedly removed and replaced, quickly and easily, to facilitate cleaning and thorough disinfection. An attractive extruded interior trim frame clamps the louver in position. By removing the frame, the louver is quickly taken out for washing and is as easily replaced. Unit is designed so that installations are at all times neat, and removal and replacement may be made repeatedly without marring doors.

More information? Circle Item 85, postcard, last page.

Water Regulating Valves

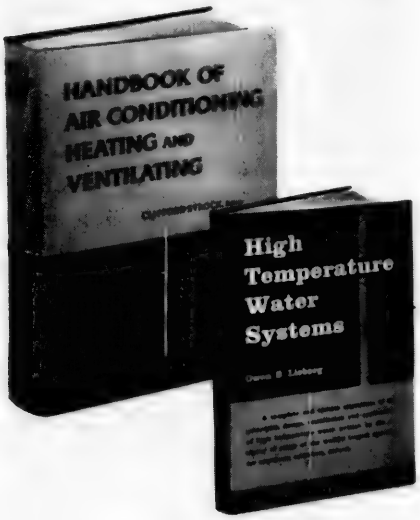
Series 246 water regulating valves, from Penn Controls, Inc., Goshen, Ind., are now available in all-range (R-12 and R-22) construction in larger sizes. The new sizes are 1, 1¼, and 1½ inches. Previously all-range valves were manufactured in ⅜, ½ and ¾-inch sizes only.

Also available in Series 247 (reverse action) are valves designated as "LR" construction. "LR" or low range valves are now manufactured in ⅜ through 1½-inch sizes. They are used primarily on heat pump applications to modulate the water to the heat source exchanger, providing maximum extraction of heat from the water.

More information? Circle Item 86, postcard, last page.

(Continued on page 126)

BOOKS TO HELP YOU IN YOUR WORK



DO YOU DESIGN HEATING SYSTEMS?

Save time, save work. Keep up-to-date with the developments in your field with authoritative references like these.

HANDBOOK OF AIR CONDITIONING, HEATING AND VENTILATING. Edited by Clifford Strock. 1094 pages, 518 tables, 598 illustrations. A wealth of working data for design engineers in air conditioning, heating, ventilating, piping and plumbing and related fields. Solves work problems with easy-to-find, dependable information. 347 pages are devoted to heat and heat transmission and cover subjects such as: fuels and combustion; heat transfer by radiation, convection and conduction; climatic data and maps; winter design temperatures; the degree-day; heat loss estimating; window condensation; steam and hot water systems; boiler ratings; service hot water supply systems; flash steam calculations; warm air heating. $15.00

HIGH TEMPERATURE WATER SYSTEMS. By Owen S. Lieberg. 224 pages, 109 illustrations. The principles, design, operation and economics of high temperature water systems (HTW). Contains the original design data, tables, graphs and specifications used successfully in some of the largest systems now in operation. The ideal working guide features a step-by-step procedure for the design of a typical HTW system. It covers: pressurization; selection of pumps, boilers and valves; piping; controls; space and process heating with HTW; applications; and an entire specification for an HTW boiler and auxiliaries. $6.50

DESIGN OF HEATING AND VENTILATING SYSTEMS. By F. W. Hutchinson. 320 pages. 96 full-page working charts give direct solutions to problems of heating and ventilating involving load determination, duct design, panel heating, solar heating and combustion analysis. Explanatory text, design examples and solutions accompany each chart. DESIGN OF AIR CONDITIONING SYSTEMS. 236 pages. By the same author. Treats the problems of cooling in the same manner as its companion book. Features 115 full-page working charts that solve air conditioning design problems directly. Like DESIGN OF HEATING AND VENTILATING SYSTEMS, background text, examples and solutions accompany each chart.
Each book $7.00, set of both $12.50

WINTER AIR CONDITIONING. By S. Konzo, J. R. Carroll and H. D. Bareither. 640 pages, 300 illustrations. Explains the why and how of controlled distribution of heat and humidity in small buildings and homes. Covers: temperature scales, how to read tables and curves, heating plans, house construction, heat loss calculations, heat generation, boilers, furnaces, radiators, convectors, and all types of warm air and hydronic systems. Includes such working data as heat loss factors for various walls; degree-days; how to estimate fuel consumption; duct design; and much more. Tells how to tailor systems to the needs of individual buildings. SUMMER AIR CONDITIONING. 560 pages, 266 illustrations. By the same authors. This basic what-how-and-why book on residential air conditioning is a training and reference book for all who design, sell, install, or operate air conditioning systems and equipment for houses and small buildings. Like its companion volume, it contains exercises for each chapter to help check reader's understanding.
Each book $8.00, set of both $15.00

RADIANT HEATING. By T. Napier Adlam. Second Edition. 504 pages, 337 illustrations. Contains basic information, design formulas and working data including a step-by-step procedure for designing effective systems. All formulas have been reduced to simplest terms and are accurate for all practical requirements. Simple, easy-to-use charts give most of the essential design data without calculation. $6.00

SNOW MELTING. By T. Napier Adlam. 224 pages, 189 illustrations. The steps in planning, designing, building and operating snow melting systems of all sizes and types are covered. Time-saving charts, tables and graphs give all the necessary data, and simplify every step. $4.50

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(Continued from page 124)

Unit Air Conditioner

Model CRVR, with finished front for total recess and spacers for semi-recessed mounting, is added to its CR line of heating-cooling units by Dunham-Bush, Inc., West Hartford, Conn.

Unit is available in four sizes, from 5600 to 21,000 Btu of cooling, and from 16,500 to 55,000 Btu of heating

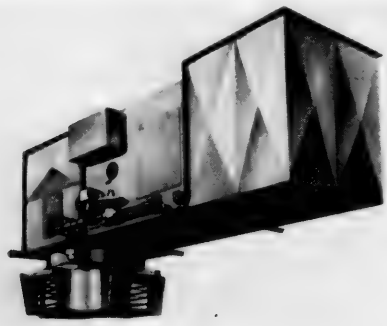
with chilled and hot water. It is available also with direct expansion coils in various heating and cooling capacities.

According to the manufacturer, the unit is designed for maximum space saving in air conditioned areas, and is highly desirable for offices, motels, hospitals, apartments, residences, and other installations where space is of major monetary consideration. Featured are individual room control, an attractive appearance, quiet operation, easy installation and filter control of cleanliness.

More information? Circle Item 87, postcard, last page.

Fresh Air Supply Heaters

Gas-fired fresh air supply heaters with high turndown ratios have been developed by L. J. Wing Mfg. Co., Linden, N. J. The high turndown ratio permits minimum temperature rise as low as 3.3 deg F, less than half that required by previously-available gas-fired equipment.



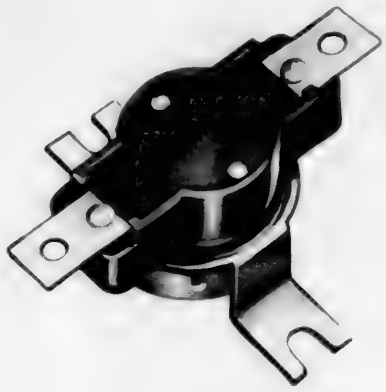
allowing comfortable heating in mild weather. Fresh air supply units provide warmed air to replace loss through exhaust systems, allowing exhaust systems to operate at rated efficiency and removing a source of drafts through doors, windows, and other openings to outdoors. In summer, units may be operated without heating, to distribute fresh outside air.

Wing GFAS units are available in five sizes, from 15,000 to 50,000 cfm and 1.5 to 4.5 million Btu per hr, based on any clean gaseous fuel with a range of 800 to 3200 Btu per cu ft. Modular design simplifies installation and ready adaptability to roof or wall intake. Units are completely wired and piped for connection to gas line and electric supply. Units are available for 220, 440, or 550-v, 3-phase, alternating current. Burners for dual-fuel operation can be furnished. A wide choice of discharge arrangements is available.

More information? Circle Item 88, postcard, last page.

Small Snap-Acting Thermostat

Development of a ¾-inch, disc-type thermostat for positive, snap-action temperature control in air conditioning, heating and ventilating equipment and other applications is announced by Spencer Products group, Metals and Controls Div., Texas Instruments Inc., Attleboro, Mass.



Because the new thermostats, designated the Klixon 206 series, are actuated by a snap-acting disc, they do not have the hunting action characteristic of creep-type controls, the company says. Units are UL tested for reliable high capacity switching action at ratings up to 25 amperes, 240 volts, a-c, resistive, and for accurate temperature repeatability over 100,000 operating cycles.

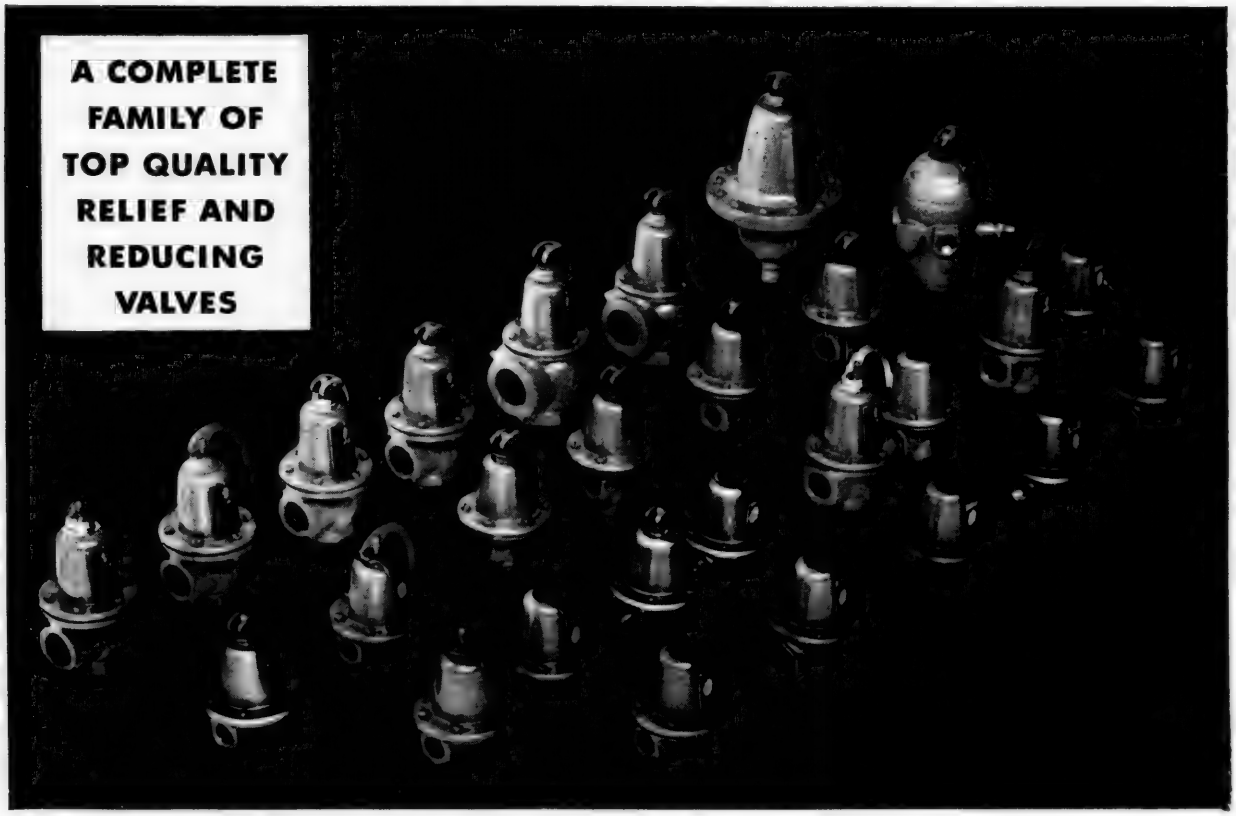
The thermostat, its switch mechanism enclosed within a phenolic case, is available with fixed temperature settings up to 350 deg F. Settings are factory calibrated and tamperproof.

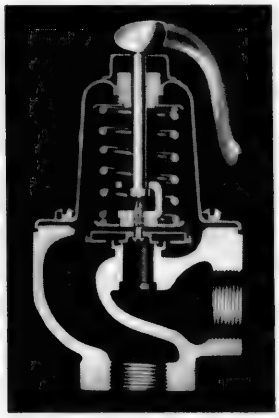
Models in the series operate either as limit switches (open on temperature rise) or as fan switches (close on temperature rise). Both automatic recycling and manual resetting types are offered.

More information? Circle Item 89, postcard, last page.

(Continued on page 128)

A COMPLETE FAMILY OF TOP QUALITY RELIEF AND REDUCING VALVES



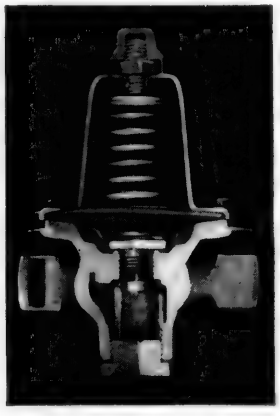


A.S.M.E. AND STANDARD RELIEF VALVES

Bell & Gossett A.S.M.E. Relief Valves, tested by the National Board and labeled with the A.S.M.E. symbol, are offered in a wide range of sizes to permit close matching of relief valve capacity to the boiler load. They are designed, built and inspected to assure that they equal or exceed A.S.M.E. code requirements.

The diaphragm construction of these valves establishes a new low differential of not to exceed three pounds, on standard setting, between opening and closing pressures. During an emergency, a B&G diaphragm-operated valve has much greater opening power, because the effective operating area of the B&G Valve is as much as nine times greater than other designs. There are no guides to jam and the resilient Silicone rubber seat is extremely resistant to the effects of high temperature.

B&G standard relief valves are built to the same high quality which characterizes all B&G products.



REDUCING VALVES...featuring Anti-Siphon Check Valve

The Anti-Siphon Check Valve feature, now included as standard on all B&G Reducing Valves, introduces an entirely new principle of check valve operation. It prevents back flow of water from a system, which might occur when city water pressure falls below the system pressure. A simple, yet extremely effective device, the Anti-Siphon Check Valve is less affected by dirt than are ball and flapper type checks.

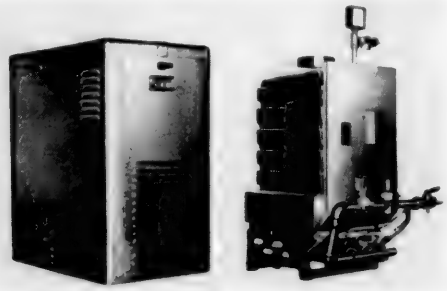
Write for your copy of "B&G Relief and Reducing Valves," Bulletin No. HZ-856A

BELL & GOSSETT
COMPANY
Dept. GF-4, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

(Continued from page 126)

Larger Gas-Hydronic Boiler

Hydrotherm Inc., Northvale, N. J., has added to its line of gas-fired hot water boilers a new unit, the Hydrotherm R-300. Designed to fit the heating needs of larger residences and multi-family dwellings, the unit is rated at



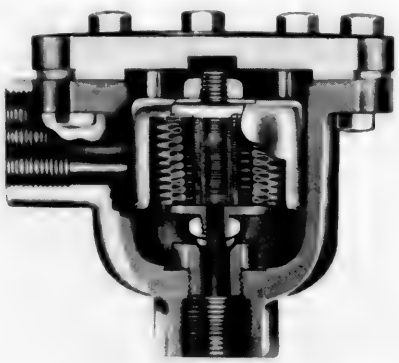
300,000 Btu per hr input capacity. However, the company reports, it is extremely compact for a boiler of this capacity, measuring only 21 by 31 inches by 36 inches high, exclusive of flue and draft hood.

The unit provides an output of 240,000 Btu per hr on natural, mixed and manufactured gases for 1200 sq ft of installed radiation, and will deliver 360 gph at an 80-deg F temperature rise when used for volume water heating.

More information? Circle Item 90, postcard, last page.

Non-Cyling Condensate Trap

Its Class TM trap is a new concept in thermostatic trap design, according to The C. E. Squires Co., Cleveland, Ohio. Trap is designed to eliminate cycling, that is, the continuous flexing from *on* to *off*. Rather, it modulates open to degrees of flow, with these advantages over conventional traps claimed:



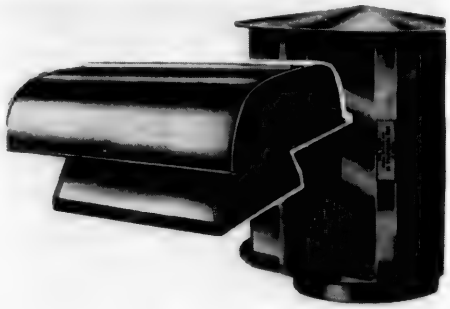
Maintenance is considerably reduced because bellows life is infinitely extended; design permits use of a proportionately greater orifice for extremely high capacity, so that a 0.460 inch on ½-inch size will handle 17,500 lb per hr of condensate at 125 psig; trap positively dead-ends with no 10-sec sweeping every closing cycle; stocking is eased, as one size trap will operate from 1-150 psig without orifice change; and traps work with equal effectiveness at atmospheric or with back pressure, and neither condensate nor air can back up into the return line to foul equipment or to freeze.

More information? Circle Item 91, postcard, last page.

Power, Gravity Ventilators

Addition of two items to its line of gravity and powered ventilation equipment is announced by Uno Ventilator Co., Malden, Mass.

The Uno-Aire aluminum power roof ventilator is of standard design, providing low contour, low cost, through-the-roof ventilation. It is intended primarily for



general purpose, utility applications where more mostly, custom-engineered models are not required, the company states.

The Uno-Ventauster is an improved stationary type gravity ventilator for use in the smaller sizes on chimneys, flues, and in the larger models, for general gravity ventilation.

More information? Circle Item 92, postcard, last page.

Foot and Line Check Valves

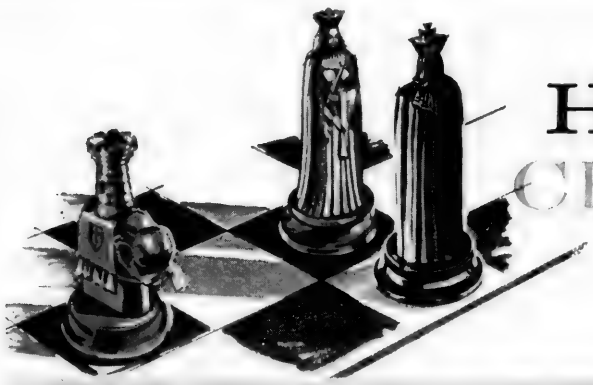
Perfection and successful testing of a disc retainer guide made of DuPont Delrin, for its line of foot and line check valves is announced by White Flomatic Div., Flomatic Corp., Hoosick Falls, N. Y.

The new disc will replace the stem and stem guide, a standby in valve design for many years, and the only moving part of the valve. Substitution of Delrin for the previous metal part is said to guarantee an extended and trouble-free valve life.

According to the manufacturer, tests at Rensselaer Polytechnic Institute showed that guide eliminates corrosive and impending mineral buildup on this crucial valve part.

More information? Circle Item 93, postcard, last page.

(Continued on page 130)

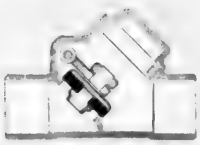


Here's how to CHECKMATE trouble...

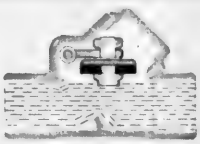
COPPER TO COPPER:
⅜" through 2" sizes.
125 SWP/200 WOG
or 150 SWP/300 WOG

F.S.P.S. TO F.S.P.S.:
⅜" through 2" sizes.
125 SWP/200 WOG
or 150 SWP/300 WOG

Specify Nibco Y-pattern check valves



GRAVITY ACTION of new Y-pattern check valve assures positive closing the instant flow ceases.



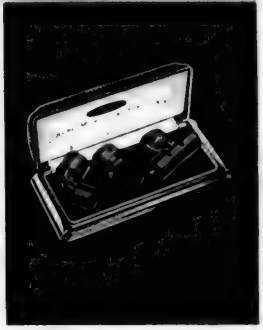
FULL FLOW is not restricted when valve is open. Disc is entirely out of path of waterway when under pressure.

POSITIVE SEATING assured for every use because valve disc can be brass, composition steam, or BUNA "N" for water, oil or gas.

VERTICAL OR HORIZONTAL, this Y-pattern check valve is equally effective. Positive closure in either position.

NIBCO check valves are rated by users as *the most dependable.* Made for heavy duty, their unique "Y" design provides quick action in opening or closing. Each valve is marked and individually tested for pressures designated. They meet exacting standards of Federal specifications, and are priced no higher than valves of old-style design.

AVAILABLE THROUGH WHOLESALERS NATIONWIDE



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NIBCO INC., Department K-6306
Elkhart, Indiana

When you need a

flame-resistant tape use

Arno® DUCTAPE

TRADEMARK

Flame-Resistant Arno Ductape complies with all building codes that require the use of fire-resistant duct tape. It continues to hold firmly at temperatures of 350-400 deg. F. Even at higher temperatures, while subject to charring, it will not support flame. Of course, it meets ASTM standards.

Like all other Arno Tapes, it sticks instantly and does not dry out or lose its grip.

Seal all ducts with Arno Ductape. Use Flame-Resistant Ductape where extra fire protection is needed.

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Warehouses at New York, Detroit, Atlanta, Minneapolis, Ft. Worth and Los Angeles. Sales offices in other principal cities.

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Dr. Scholl's Adhesive Tapes Division
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Please send me a free 15-ft. sample. ☐ Flame-resistant, ☐ Non flame-resistant. I am a ☐ Jobber, ☐ Contractor.

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Company

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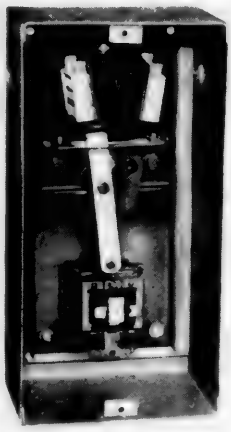
City State

MANUFACTURERS AGENTS WANTED FOR SELECTED AREAS

(Continued from page 128)

Controls Duplex Equipment



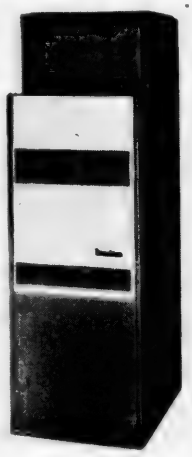
An alternator for controlling alternate operation of duplex or dual motor-driven equipment, such as pumps for heating, vacuum, sewage, water supply, process, and for compressors or any equipment where stand-by units are involved, is available from Whittington Pump & Engineering Corp., Indianapolis, Ind.

According to the manufacturer, the unit is simple, logical, easy to connect, and is built for long service. The action has no moving parts and closes with a snap. Further, the company states, there are no energized coils between cycles, no flutter, and no adjustments.

Units are available for standard voltages and frequencies as well as for special requirements. Enclosures other than Type I are available for specific locations.

More information? Circle Item 94, postcard, last page.

Central Heating, Cooling Units



Fraser & Johnston Co., San Francisco, Calif., announces its 1960 line of gas fired furnaces, evaporators, condensing units, reverse cycle heat pumps, air handling units, and self contained and remote units up to 15 tons. Included is a change of color to a two-tone golden tan, the firm reports.

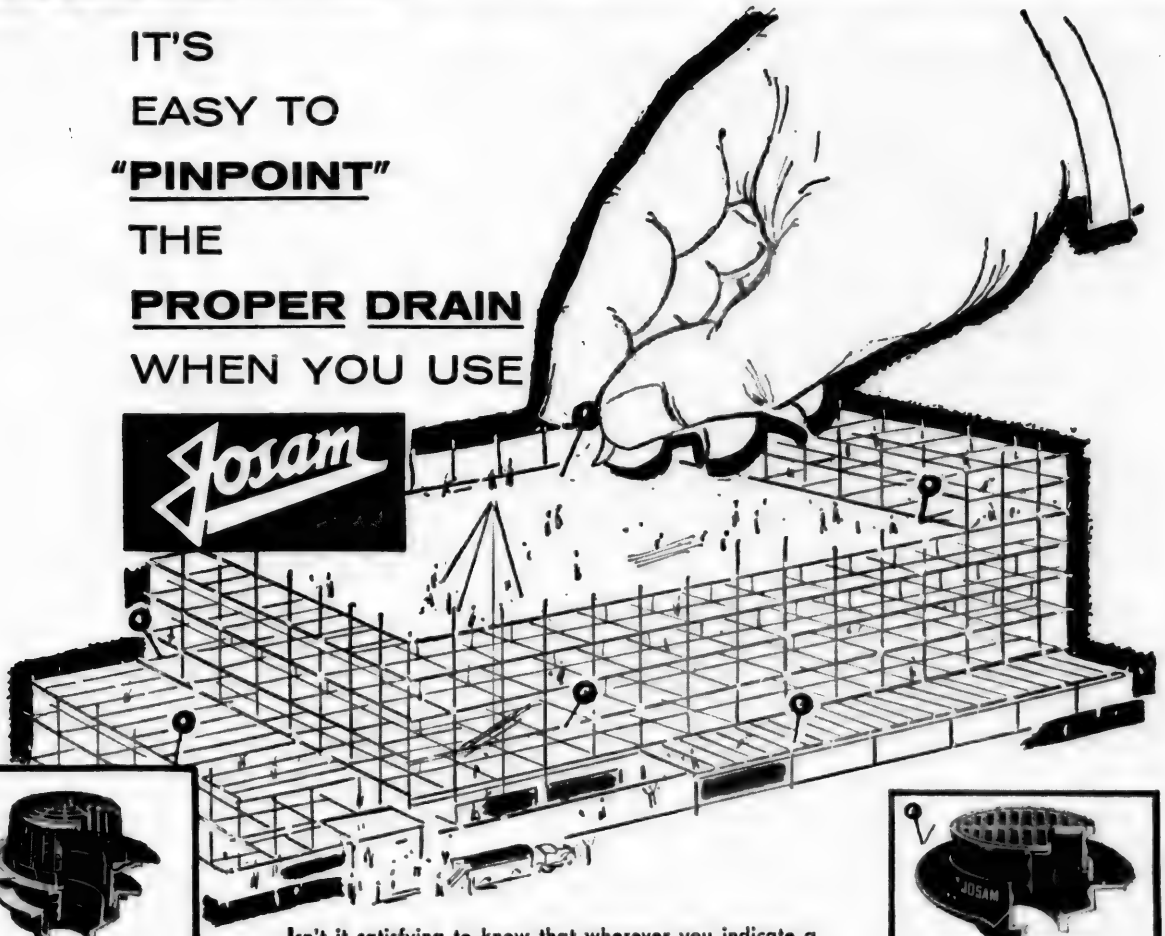
These models provide both central heating and cooling with minimum space requirements. Other engineering features, according to the company, give increased efficiency, quietness, and ease of service. Units may be interlocked so that any requirements of heating and cooling may be achieved.

Shown in photo is the company's downflow furnace, Model 100R518, with a matching slideout evaporator assembly.

More information? Circle Item 95, postcard, last page.

(Continued on page 132)

IT'S EASY TO "PINPOINT" THE PROPER DRAIN WHEN YOU USE Josam



Series No. 4550
"Leveleze" Adjustable
Roof Drain

Series No. 3510
"Leveleze" Adjustable
Floor Drain

Series No. 4010
Promenade Deck
Roof Drain

Series No. 7020
"Super-Flo"
Floor Drain

Isn't it satisfying to know that wherever you indicate a drain . . . whatever the drainage condition . . . from roof to basement . . . that you can get the exact drain you need from Josam? This means that you can save countless hours of time . . . avoid guesswork and error . . . assure maximum service on every job, simply by checking with Josam first.

The Josam line of drains today is the most complete in the industry because it has been constantly expanded to meet the changing needs of advanced building. As a result Josam drains are engineered to install easier . . . perform better . . . yet cost no more than ordinary types. Don't waste a minute when you have to "pinpoint" any plumbing drainage product — call Josam. You'll be time and money ahead.

Series No. 300-35C
Shower Drain with
adjustable strainer

Series No. 5440
Non-Clog
Floor Drain

Series No. 680-V
Industrial Drain with
tractor grate

Series No. 0300-R
Trench Drain with
sediment bucket

SEE JOSAM BOOTH 221 N.A.P.C. Cleveland

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765 Folsom Street San Francisco 7, Calif.

Josam Products are sold through plumbing supply wholesalers.

JOSAM MANUFACTURING CO.
Dept. HV-6 Michigan City, Indiana
Please send Catalog K showing complete line of drains.

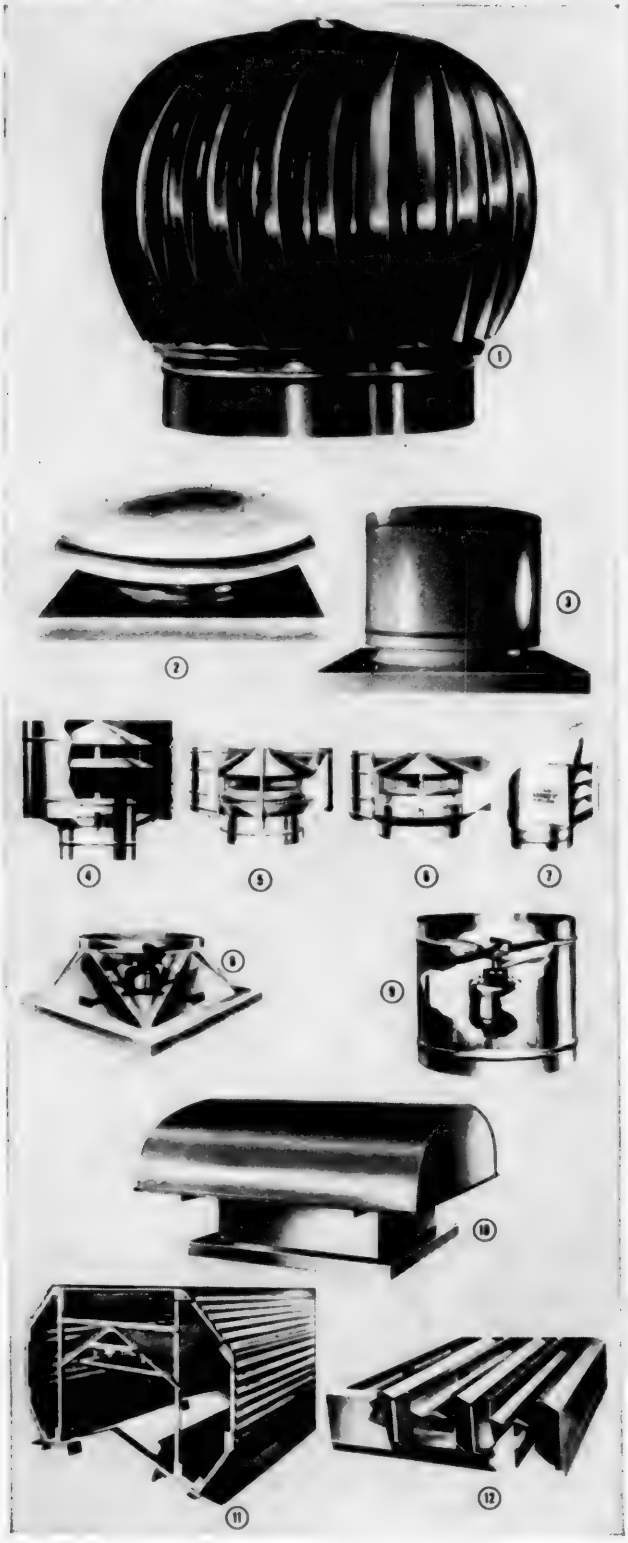
Firm .....

By ..... Title .....

Address .....

City ..... Zone ..... State .....

No Need to Look Further...



Write today for nearest representative

WESTERN ENGINEERING AND MFG. CO.

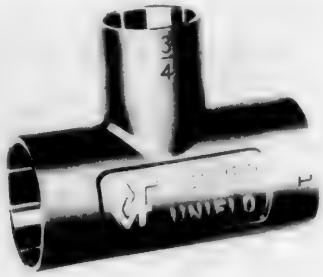
P.O. Box 66455
Los Angeles 66, California

Complete Catalog in Sweets, Member Air Moving and Conditioning Assoc., Inc.

(Continued from page 130)

Diversion Fittings

Designed to fulfill all requirements for diversion fittings, Super Uniflo fittings, in all popular sizes, provide adequate flow diversion without excessive resistance under average heating system conditions, according to the manufacturer, General Fittings Co., East Greenwich, R. I.



These units feature cast-in, machined nozzles. Rugged, cast bronze construction and accurate machining are reported to provide life-of-system service. Design permits use in up-feed supply, up-feed return, down-feed supply or down-feed return according to needs of particular system. For most riser installations, a single fitting installed on either the supply or return line will provide sufficient divergence for the branch. In some cases, fittings may be required on both supply and return lines. Fittings may be installed in either return or supply risers by rotating end for end, according to integral flow arrows indicating proper flow direction.

An air-relieving hole between the "main" and "riser" portions of fitting eliminates air pockets in piping system which could cause excessive noise (turbulence), decreased flow, and system unbalance.

More information? Circle Item 96, postcard, last page.

Seven-Cycle Water Conditioner

Water conditioners, offered by Magisoft, division of Aurora Water Queen Corp., Aurora, Ill., feature a seven-cycle regenerator control system. According to the manufacturer, the system renews the minerals used by the conditioner to extra-high capacities, providing unusual efficiencies.

The seven-cycle system replaces the two-cycle valves most commonly used and the 4-cycle system of more expensive units. A device the company calls an Electronic Memory is said never to fail to regenerate the water conditioner before the water gets hard or rust appears.

The company's sealed brine system makes it impossible for units to overflow and prevents scaling and other unsightliness. Non-corrosive plastic materials used in construction of the units ensure long life, the company states.

Conditioners are available in three domestic sizes and in commercial and industrial units that are job-rated for motels, hospitals, schools, and industry.

More information? Circle Item 97, postcard, last page.

Metallic Bellows Flowmeter

A metallic bellows flowmeter is introduced by Fischer & Porter Co., Warminster, Pa.

This differential pressure measuring device can be used for both flow and liquid level applications. It is accurate within ½ of 1%, using no mercury, seal-pots, purges or stuffing boxes. Meter body is completely self-draining and

self-venting and is rated at 2000 and 500 psig in steel and stainless steel. The flowmeter has ranges from 0-20 to 0-300 inches of water and may be changed by a simple exchange of the range spring assemblies.

The instrument, which can indicate and record, can be equipped with a controller, totalizer, or with a pneumatic or electric transmitter. Additional pressure and temperature indicators or pens are available.

More information? Circle Item 98, postcard, last page.

Computers for Control

Bailey Meter Co., Cleveland, Ohio, has concluded an agreement by which it will apply the Packard Bell Computer Corporation's new medium-scale "second generation" computer as a component of Bailey Systems for power plants and industrial processes. This solid-state digital computer has a large expandable memory and computing speeds in the microseconds.

The computer will be integrated into the company's Metrotype digital systems and combined with its instruments, controls, and analog computers to provide compact closed loop control and information systems. This arrangement will enable plants to apply data processing and computer control systems step-by-step or in any combination as their use becomes economically justifiable. Engineering of the integrated systems is scheduled for completion so that marketing will start late in 1960.

The resulting integrated systems will be applied to the control of power and process operations which require extensive real-time calculations to achieve optimum performance. Steam-electric power plants, electrical transmission and distribution systems, chemical plants, paper mills, cement plants, petroleum refineries and metal smelting and refining plants are among those having certain operating problems of sufficient importance to justify on-line computations.

More information? Circle Item 99, postcard, last page.

This man is balancing an air flow system for the first and last time

No call backs to correct hot or cold spots when the system is set up right the first time with an

Alnor VELOMETER®

Instant reading of air flow, in feet per minute, at outlets and draw of air at returns gives an accurate check on engineered systems. The Velometer has a range from 20 f.p.m. to 3000 f.p.m. or 6000 f.p.m.

The Velometer will also give direct readings of static pressure in ducts, plenum chambers, or pipes. Registers pressure loss across heater and filters, friction loss at ells and deflectors. Many government and municipal jobs require Velometer checking before acceptance. Every air heating and air conditioning engineer on the job can save time and be sure of peak efficiency of the system by Velometer testing.

Velometer No. 3G

The Velometer, set No. 3G recommended for commercial heating and air conditioning, is priced at only $194.00 including a sturdy reinforced carrying case. Bulletin No. 2448 gives complete operating facts and various types of jets and accessories.

Alnor INSTRUMENTS

PYROMETERS — VELOMETERS — DEWPOINTERS

Illinois Testing Laboratories Inc.
Chicago 10, Ill.

Illinois Testing Laboratories Inc.,
Room 570, 420 N. LaSalle St., Chicago 10, Ill.
Please send Velometer Bulletin 2448.

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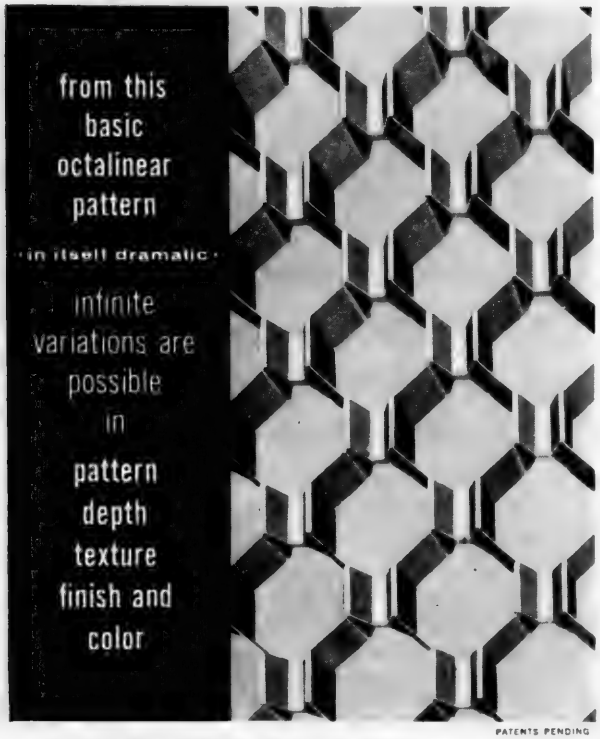
Company_____

Address_____

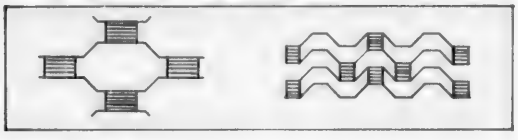
City_____ Zone_____ State_____

THE NEW C/S OCTALINEAR GRILLE

—with exciting opportunities for original architectural expression



■ **vary the pattern—in many ways**



■ **vary the spacer**
Many variations in flat, projected, or recessed faces for highlight and shadow effects.

■ **vary the finish and color —in imaginative combinations**
Clear, blue or gold anodize—a wide choice of colors in epoxy, vinyl, and porcelain enamel finishes to choose from.

■ **or vary the grille position**
Startling different effects achieved when placed horizontally or vertically, when seen from the front, side, back, or placed overhead.

The C/S OCTALINEAR GRILLE—in aluminum, offering the architect unusual opportunity to develop original designs in solar grilles and in vision or decorative screening, within the building budget.

For samples and specifications—write

C/S CONSTRUCTION SPECIALTIES, INC.
• 55 Williams Avenue, Cranford, New Jersey
• West Grand Street, Escondido, California

Central Air Conditioner

Simplicity of design and installation and easy field servicing characterize 1960 models of the Coleman Polar-Pak, a self-contained central air conditioner for attic, crawlspace or outside installation.

Announced by The Coleman Co., Inc., Wichita, Kan., these models incorporate a new filter-drier to trap moisture and impurities in the refrigerant system. Addition of

a sub-cooled cap tube gives greater efficiency over a wider range of temperature, the company reports.

Entire unit has been sound conditioned and finished in Duracron, a rust resistant acrylic baking enamel. Once installed, the unit need never be removed for servicing. To eliminate shop repairs, the manufacturer has added charging valves, positioned the compressor and electrical controls for ready accessibility, and extended the electric service wires and condensate drain to the outside for simple, quick connection.

A low pressure switch protects the compressor against burnout. Fan and blower motors are of the split-capacitor type. Unit is completely air cooled and may be used with prefabricated ducts, company's Blend-Air perimeter systems, or tied into an existing forced air system.

More information? Circle Item 100, postcard, last page.

Paints Surfaces to 1700 Deg F

Availability of Heat-Rem H-170 in eighteen high-heat-resisting colors that can be applied on surfaces previously regarded as too hot to paint is announced by Speco, Inc., Cleveland, Ohio.

Coatings, depending on the shade used, are said to permit color coding or complete finishing of metal components subjected to temperatures from 600 to as high as 1700 deg F. Typical applications include heat transmission lines, traps, stacks, vents, condensers, compressors, ovens, engine heads, mufflers, radiators, exhaust manifolds, etc.

Most colors contain a combination of non-leafing aluminum and a metallic pigment. Unlike ordinary aluminum, non-leafing particles are said to remain equally distributed and in constant suspension, providing uniform coverage in the applied coat. This is reputed to make possible virtual fusion of the paint with hot metal surfaces. In addition, the bright, elastic finish is resistant to moisture, mild acids, alkalies and industrial fumes.

More information? Circle Item 101, postcard, last page.

ENVIRONMENTAL HEALTH

(Continued from page 16)

obtain additional data, before acting on the 1961 budget, the subcommittee held special hearings on environmental health on March 8 and 9, 1960.

A 203-page report, containing the Public Health Service study and the statements of non-Federal and Federal authorities who testified during the two-day hearings, has been published by the U.S. Printing Office for the House Committee on Appropriations under the title "Report on Environmental Health Problems." This published report includes:

Subcommittee Findings

After hearing the evidence, the members of the subcommittee concluded that the health hazards resulting from changes in the environment are far greater than is generally realized and that all levels of government, industries, and research and educational institutions need to step up their efforts to deal with the problem.

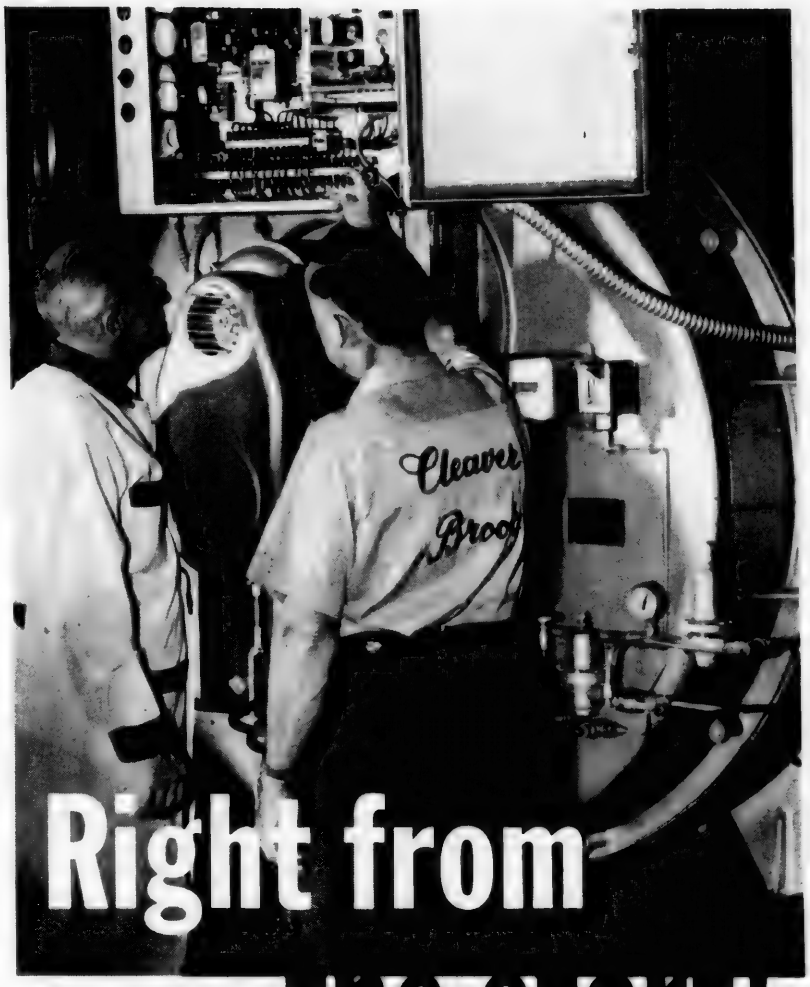
Nature of the Problem

Whereas the old-fashioned environmental health hazards, such as bacteria in food and water supplies, caused acute illness within a short time, the new hazards, such as radiation and chemical poisons, have no obvious immediate effects but, absorbed into the body in small amounts over a long period of time, may ultimately cause chronic illnesses or premature deaths.

To learn more about these modern hazards and to control them are tasks that require many different kinds of specialists, operating in unfamiliar teamwork patterns. Moreover, the remedial measures that need to be taken to reduce the hazards may require readjustments in the organization and work patterns of governmental bodies, industries and other segments of society.

Organizational Plan

The Public Health Service reported that it could give more efficient help to States and communi-



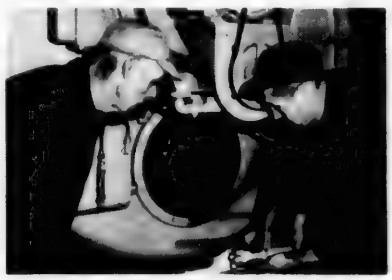
Right from the start!

Cleaver-Brooks starting service assures lasting satisfaction — it's included with the purchase of every Cleaver-Brooks packaged boiler you install

Here's how Cleaver-Brooks takes a big load off your shoulders. At the job site, a factory-trained specialist checks 32 vital areas and personally makes sure that your customer's Cleaver-Brooks boiler runs right from the start. He adjusts it carefully for the fuel it burns . . . checks over details of operation . . . takes CO_2 ratings . . . starts the boiler and trains the operator in care and maintenance.

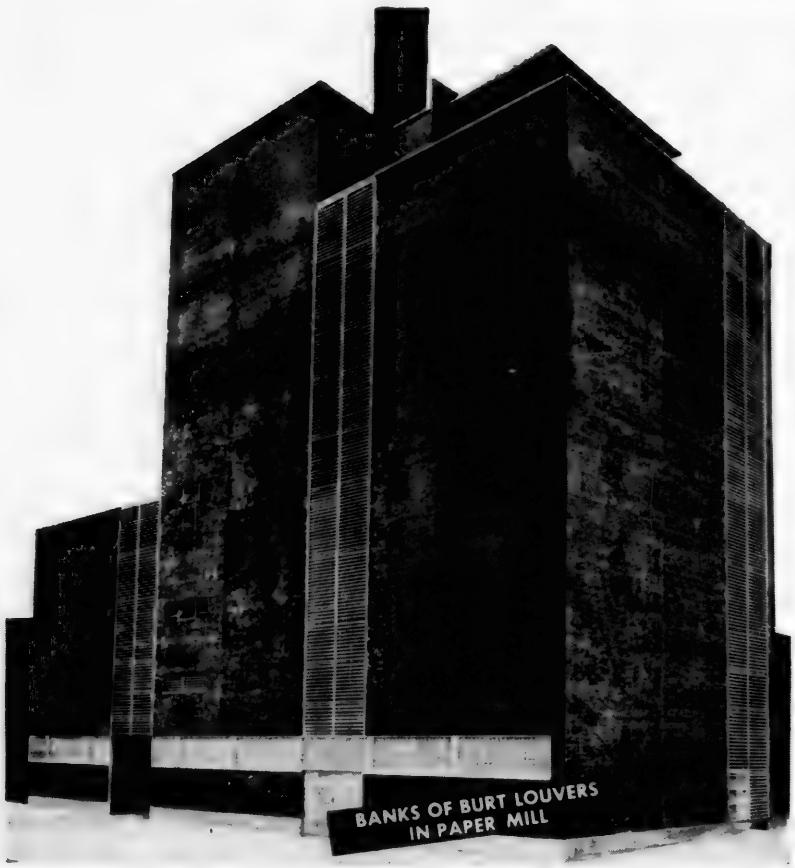
This comprehensive service means superior performance, satisfied customers. It also means fewer hours on the job for you . . . less cost . . . fewer callbacks. But getting your customer's boiler off to the right start is just the beginning of Cleaver-Brooks complete follow-up responsibility. For example, the industry's finest parts facilities available coast to coast and in Canada back up every boiler purchase . . . safeguard your customer's investment.

Cleaver-Brooks manufactures 130 models of packaged boilers, 15 to 600 hp, gas, oil or gas/oil fired. For the full story, call your representative or write Cleaver-Brooks Company, Dept. G. 315 East Keefe Avenue, Milwaukee 12, Wisconsin.



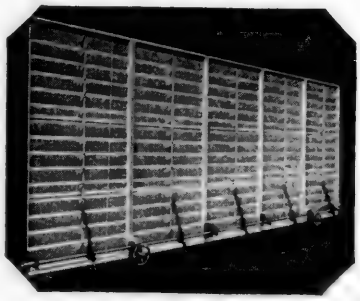
BOILER SCHOOL — A Cleaver-Brooks serviceman also trains the boiler attendant . . . instructs him in boiler care and operation. You're relieved of the time and cost of this important follow-up responsibility.

Cleaver Brooks®
ORIGINATOR AND LARGEST PRODUCER OF PACKAGED BOILERS



BURT LOUVERS ARE VITAL VENTILATING EQUIPMENT

Air removed from a building with gravity or fan ventilators *must* be replaced. Burt Wall Louvers, with fixed or adjustable blades, provide efficient, weatherproof air inlets. The Burt line is complete, from general purpose models to industrial types and includes removable screens, louver operators and other accessories. Burt experience and specialized equipment also provide every facility to economically construct special units when required.



Series of Burt Adjustable Louvers

Send for **FREE** *Data Book!*

Write for Burt Data Book SPV-17-B. It Supplies quick data on Burt's complete line of modern Wall Louvers.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

The Burt Manufacturing Company

49 E. South St. Akron 11, Ohio

MEMBER AIR MOVING & CONDITIONING ASSOCIATION, INC.

ties in coping with these problems if it brought together its water, air, radiological and other environmental health activities in a special environmental health unit. This unit would include centers in various parts of the Nation that would be staffed to provide technical assistance, conduct monitoring programs, carry on research, and give training courses. (The Public Health Service has a task force working on the details of this organizational plan; a report of the plan will be given to the subcommittee before the end of fiscal 1961.)

Increased Hazards

The amount of radioactive material that has now been distributed in the U. S. exceeds by many orders of magnitude the radiation from all of the world's radium that had been extracted up to 10 or 12 years ago.

The number of chemical materials man is being exposed to are also increasing. Over 600 chemicals are added to food; over 600 million pounds of pesticides are used each year.

Radioactive and chemical materials are merely the newest and most rapidly increasing contaminants of air, water, land, and food. Viruses, bacteria, and other organic pollutants, insects, rodents, and other disease carriers, are older but continuing health hazards in the environment.

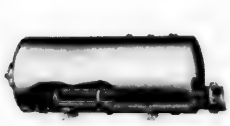
As the population grows to an estimated 214 million by 1970, most of them clustered in metropolitan areas, and as the gross national product increases from its present 451 billion dollars to an estimated 790 billion dollars by 1970, all these environmental hazards will become more serious.

Public Policy Decision

New health hazards inevitably accompany new technological advances. It is the task of health specialists to determine the nature and extent of these hazards and to find ways of keeping their harmful effects to a minimum. It is the responsibility of the public and their elected representatives to decide how much progress should be paid for by how much sacrifice of healthful surroundings.

we'll get you into HOT WATER!

...and keep you there with **ADSCO HEATERS**



ADSCO STORAGE WATER HEATERS
have removable heating elements. Many materials available for tank construction, including solid or clad corrosion-resistant metals. Linings include ADSCO Phenolic No. 6-2, ADSCOTE, or galvanizing. Bulletin 54-75.

ADSCO INSTANTANEOUS WATER HEATERS AND CONVERTORS
are furnished in either steam-tube or water-tube type. Design is simple U-bend with removable element. Convertor Bulletin No. 54-77; Instantaneous Bulletin No. 54-78.

An abundance of hot water flows continuously from dependable ADSCO Heaters... for use in washrooms, space heating, or processing. ADSCO Heaters are engineered for maximum heat exchange efficiency, built out of quality materials by workmen whose legacy of experience dates back to the year 1877. Best of all, ADSCO Heaters are manufactured from numerous *standard designs*. This keeps costs down while still providing a wide choice of capacities... Write for bulletins.

ADSCO ENGINEERED PRODUCTS
Sold, Engineered and Manufactured by
YUBA HEAT TRANSFER DIVISION
HONESDALE, PA.
World's Oldest and Largest Manufacturer of Packed and Packless Expansion Joints

YUBA

YUBA CONSOLIDATED INDUSTRIES, INC.

YUBA — A growth corporation serving growth industries
chemical
petroleum
steam — electric
hydro — electric
aeronautics
construction
heating
air-conditioning
consumer durable

BRIEFLY STATED NEWS ITEMS

LEAD INDUSTRIES ASSOCIATION, including its expanded research program, announced the removal of its offices to 292 Madison Ave., New York 17, N. Y.

WITH THE ENGINEERS

MAX A. MORGENSTERN, consulting engineer specializing in mechanical equipment, announces the establishment of his office at 8 East Prospect Ave., Mount Vernon, N. Y. . .

Appointment of Lawrence J. Smith as vice-president in charge of research at BELL & GOSSETT CO., Morton Grove, Ill., was announced. Mr. Smith, formerly director of research, joined the company in 1930 as Chicago field engineer. He was named director of research in 1943. Prior to joining B & G, he was an engineer with Underwriters Laboratories, Chicago. . .

Dick Riordan has been appointed chief engineer, Summer Air Conditioning, BURNHAM CORPORATION, WARM AIR & COOLING DIVISION, Belle Vernon, Pa. Mr. Riordan, who has had seventeen years of diversified experience in the refrigeration and air conditioning field, recently completed two years with Mathes Company, as chief engineer, room air conditioners. He developed a line of remote air conditioners for Addison Products Company, a major appliance manufacturer and, before joining Addison, spent some time in the air conditioning sections of International Harvester Company and Servel, Inc. . .

S. R. Hill has been appointed a senior staff engineer in the commercial-industrial section of WESTINGHOUSE AIR CONDITIONING DIVISION, Staunton, Va. In his new position, Mr. Hill will be responsible for marketing of commercial packaged cooling equipment up to 30 tons. During 1958 and 1959, he was a partner in a consulting engineering firm in Oklahoma City.

BURGEONING BUSINESS

The combination of C. H. WHEELER MFG. CO., Philadelphia, and GRISCOM-RUSSELL CO., Massillon, Ohio was announced. They are both subsidiaries of Hamilton-Thomas Corporation. According to the announcement, the advantages offered by this combination are improved and increased selection, distribution and service. The companies offer components for a variety of applications in power plants, marine process as well as in nuclear systems. . .

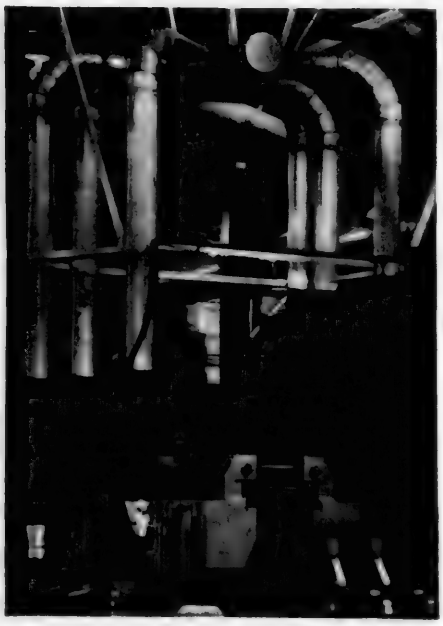
CRANE CO., Chicago, Ill., has purchased the fixed assets and inventory of General Air Conditioning Corp., Los Angeles, Calif., manufacturers of heat pumps, reverse cycle air conditioners and kitchen equipment, including range-refrigerator-sink combinations. Present sales and service to customers will be maintained through General Air Conditioning's national distribution system. The company will be operated as a division of Crane's Plumbing-Heating-Air Conditioning Group, which is headquartered in Johnstown, Pa. . .

Construction has started on an approximate 50,000-sq ft, half-million dollar addition to the heating and air conditioning plant of LENNOX INDUSTRIES INC., Marshalltown, Iowa. The building project includes three new buildings and extensive remodeling of existing buildings. Target date for completion is early 1961. Besides the factory, Lennox maintains corporate headquarters, research laboratory and marketing services in Marshalltown. Other Lennox plants are located in Columbus, Ohio; Syracuse, N. Y.; Fort Worth, Tex.; Decatur, Ga.; Salt Lake City, Utah; Los Angeles, Calif.; Des Moines, Iowa; as well as two Canadian plants located in Toronto and Calgary. . .

W. D. ALLEN MANUFACTURING CO., Bellwood, Ill., manufacturers of lawn sprinkling and fire protection equipment, has expanded its West Coast operations to include a new warehouse and sales office in Los Angeles. John Searfoss, who joined the company nineteen years ago, has been appointed Western Sales Manager.

(Continued on page 140)

YOU SAVE MORE WITH FLEXAUST® HOSE



Thousands of successful installations prove that use of Flexaust hose and Portovent retractable duct with metal duct systems lower installation costs – but there are other important advantages

Exceptional abrasion resistance
Corrosion resistance
Noise absorption
Durability under heavy flexing
Provision for expansion and contraction
Easy relocation of hoods and machines

Made of high quality neoprene coated fabrics 1¼ to 36" i.d.

Write today for full details
Distributors in all principal cities

THE FLEXAUST CO.

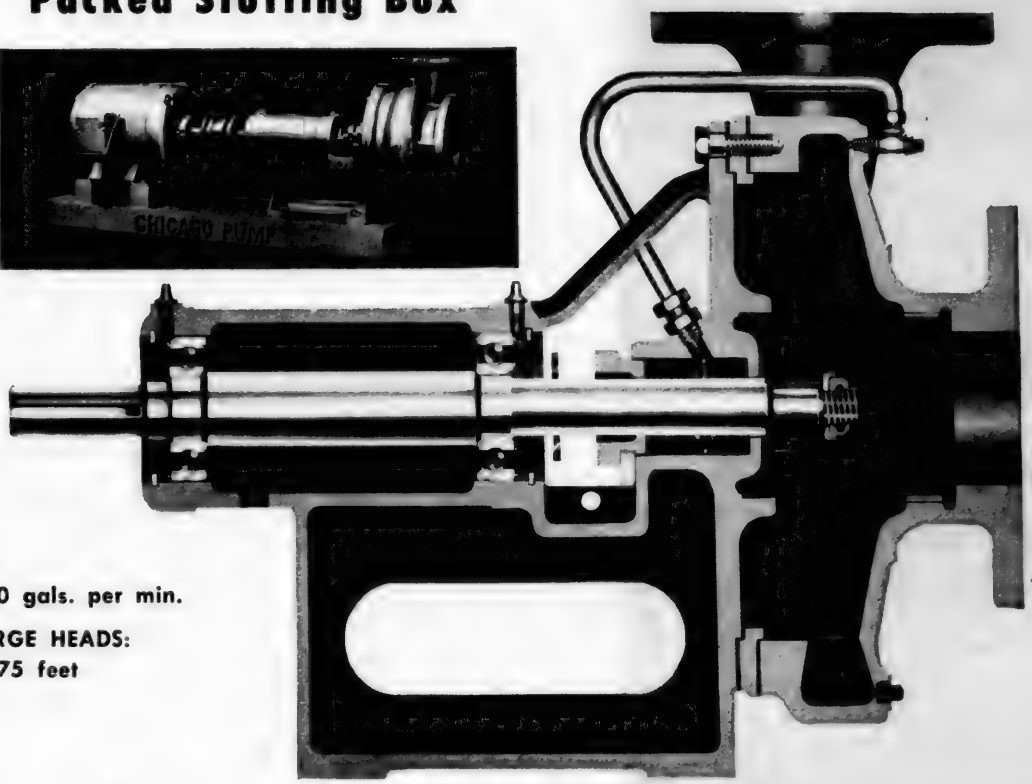
DEPT. HV-6 100 PARK AVE. NEW YORK 17, N. Y.

"from Chicago" For Hot Water Systems, Cold Water Systems, Air Conditioning, General Industrial use

The NEW FCP

FLEXIBLE-COUPLED PACKED

CENTRIFUGAL PUMP with Packed Stuffing Box



CHECK THESE 5 "Chicago" FEATURES

1. Designed for hot water heating systems with temperatures to 250° F.
2. Successfully handles impurities normally present in heated and unheated water systems.
3. Quiet operation.
4. Constructed to give efficient, trouble free operation.
5. Backed by more than 50 years experience building quality pumps.

- 5 to 900 gals. per min.
- DISCHARGE HEADS: 10 to 275 feet

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION
HYDRODYNAMICS DIVISION

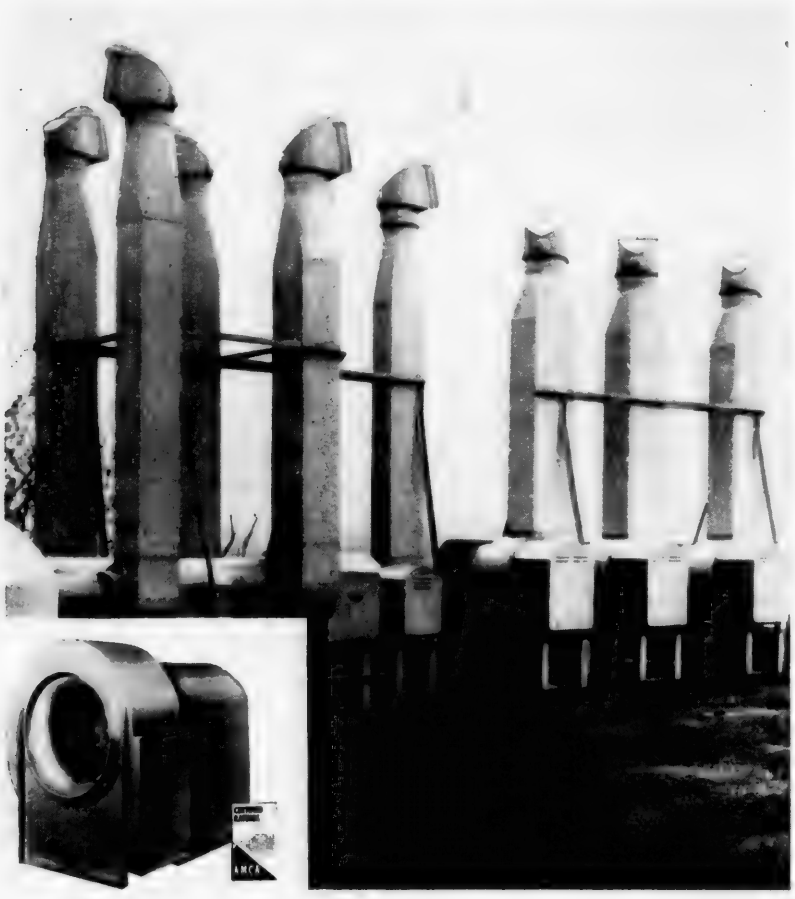
CHICAGO PUMP

622J DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Write for Bulletins 107 and 107-H

© 1960—CP—F. M. C.

ANOTHER PEERLESS ELECTRIC SPECIAL BLOWER APPLICATION



Peerless Electric Blowers Remove Fumes At Gulf Research Center

Shown here are Peerless Electric Backward Curve Blowers applied to exhausting flammable and harmful vapors from the cleaning room of Gulf's Automotive Products Evaluation Laboratory. These heavy duty blowers have arc-welded wheels with cast iron hubs and non-slip taper lock bushings.

Peerless Electric can engineer a blower for *every* important air moving job. Units, similar to this, are available for continuous supply and exhaust duty in air conditioning systems of schools, hospitals, public buildings and industrial installations.

On your next job, let Peerless Electric engineer your air moving needs. Write to: *Peerless Electric Division, H. K. Porter Company, Inc., W. Market Street, Warren, Ohio.*

PEERLESS ELECTRIC DIVISION

PORTER

H. K. PORTER COMPANY, INC.

PORTER SERVES INDUSTRY with steel, rubber and friction products, asbestos textiles, high voltage electrical equipment, electrical wire and cable, wiring systems, motors, fans, blowers, specialty alloys, paints, refractories, tools, forgings and pipe fittings, roll formings and stampings, wire rope and strand.

Briefly Stated

(Continued from page 138)

CONTINENTAL CONTROLS CO., P.O. Box 192, Nashua, N.H., has been organized to manufacture a line of electro-hydraulic controllers, called servo-valves.

Werner G. Holzbock is president. He had been manager of the Instrumentation and Control Systems Department of Sanders Associates, and chief engineer of GPE Controls, the former Askania Regulator Company. He is the author of two widely known textbooks: *Instruments for Measurement and Control*, and *Automatic Control*. (Both of these books are published by Reinhold Publishing Corporation and are available from The Industrial Press, publishers of Air Conditioning, Heating and Ventilating.)

The new company provides a consulting service for their customers to assist in special control problems. To solve such problems it will, if necessary, design and build specialized hardware. The company will operate through local distributors and invites inquiries for distributorships. . .

REPUBLIC-TRANSCON INDUSTRIES, INC., Los Angeles, Calif., independent water heater manufacturer, completed its internal corporate setup, following through on the recent merger that made it publicly-owned. The company has formally absorbed, and made a division of, its predecessor water heater company, Republic Appliance Corporation. The latter had continued briefly as a subsidiary after the February merger, in which the management acquired control of Trans Continental Industries and changed its name to Republic-Transcon Industries.

Through the present follow-up merger with its subsidiary, Republic-Transcon will directly operate its plants at Los Angeles, Chicago and Erie. Fowler Manufacturing Co., hitherto a Republic Appliance subsidiary operating the Portland, Ore., plant, becomes a direct subsidiary of Republic-Transcon, as does the newly acquired Dallas firm of Texlite, Inc., which has added Republic water heaters to its established line of porcelain and enamel outdoor signs and wall panels. . .

RECENT APPOINTMENTS

William J. McKeough, Hartford, Conn., has been appointed a sales representative for commercial refrigeration and air conditioning products by DANVILLE DIV., BOHN ALUMINUM & BRASS CORP., Danville, Ill. He will cover the states of Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont, Maine and Upper New York State. Mr. McKeough has been in the commercial refrigeration, air conditioning and heating field for thirteen years; specializing in low temperature units. . .

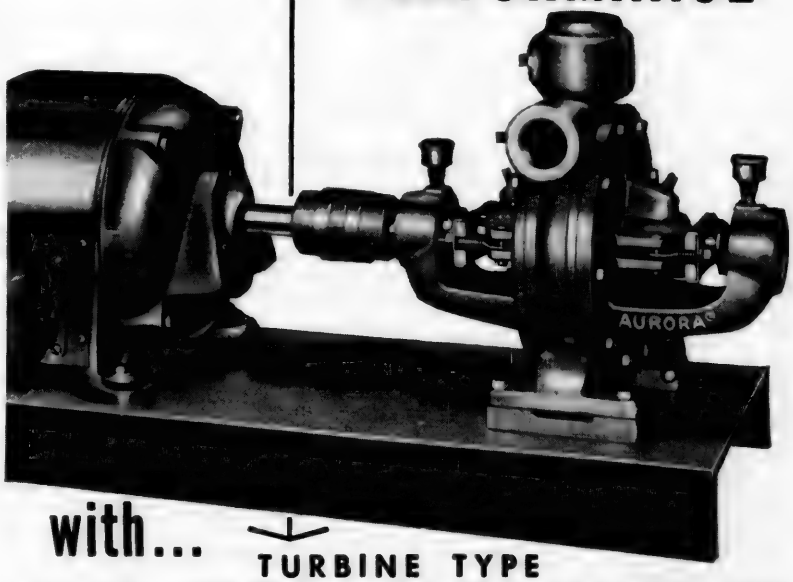
JAY R. SMITH MANUFACTURING CO., Union, N.J., has announced the appointment of Charles R. Villyard, P. O. Box 10566, Oklahoma City, Okla., as sales representative for the company's line of chair carriers, drains and engineered plumbing products, in Oklahoma. . .

LOWRIE & COMPANY, Pasadena, has been appointed sales representatives in the Los Angeles area for MODINE MANUFACTURING CO., Racine, Wis. The firm will represent the full line of Modine unit heaters, convectors, air conditioners, heating and ventilating units, gas-fired duct furnaces and gas blower units, and cabinet unit heaters. R. T. Lowrie, president of the firm which was formed to specifically represent Modine in the area, was formerly president of Royal Jet, Inc. H. G. Merkel, vice president, had been chief engineer of Royal Jet, Inc.

H. W. Rainey has been named marketing manager of the WESTINGHOUSE STURTEVANT DIVISION, Hyde Park, Mass., it was announced. Formerly general sales manager, Mr. Rainey will be responsible for all phases of marketing activity in his new position, including field sales and marketing services. . .

Russell K. Annis is appointed manager of engineering, AURORA PUMP DIVISION, THE NEW YORK AIR BRAKE CO., Aurora, Ill. Formerly chief engineer at the Kansas City works of Fairbanks Morse and Company, Mr. Annis comes to Aurora with a broad background of

Profit by... CONTROLLED PERFORMANCE



with... TURBINE TYPE APCO PUMPS

- PROVEN DEPENDABILITY
- CALCULATED CAPACITIES
- RUGGED CONSTRUCTION
- HIGHEST QUALITY CONTROL
- APPLICATION ANALYSIS
- SELECTED COMPONENTS
- MINIMIZED WEAR
- SERVICE FLEXIBILITY
- PRESSURES TO 400 P.S.I.
- CAPACITIES TO 150 G.P.M.

Ruggedness of construction and simplicity of design of APCO turbine type pumps combine to provide longer life, high efficiency, and minimized down time. This means more for your "pump operating dollar." With APCO *steep impeller* characteristics there is little capacity change under fluctuating head conditions. Select from the "1001" types, sizes, and capacities of AURORA pumps to obtain *the one* specifically designed to fit your needs.

APCO turbine type pumps are most frequently used for: Boiler Feed, Condensate Return, Fresh Water Service, Brine Service, Ice Water Circulation, Filter Service, LPG Service, Transfer Service, Caustic Liquid Handling, Sprinkler Service, Spraying Service, Water Treatment, Booster Service, and High Temperature Service.

WRITE TODAY FOR NEW BULLETIN S-111

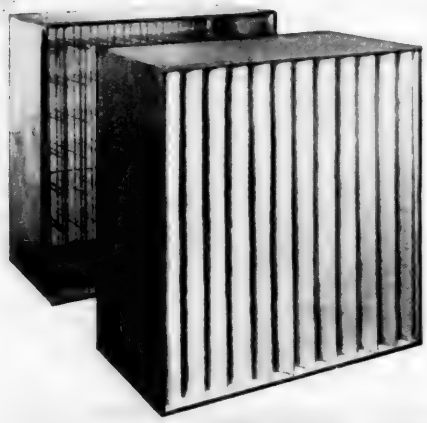
AURORA always PUMPS

AURORA PUMP DIVISION
THE NEW YORK AIR BRAKE COMPANY
690 LOUCKS STREET • AURORA • ILLINOIS

LOCAL DISTRIBUTOR IS LISTED IN THE YELLOW PAGES OF YOUR PHONE BOOK

The Cambridge AEROSOLVE® Filter is the RELIABLE Filter

- High Efficiency
- Positive Filtration
- Low Pressure Drop
- Easy Installation & Maintenance
- High Velocity — 450 FPM
- Expert Technical Assistance



Be specific about filter efficiencies

Compare!

EFFICIENCY — STANDARD TESTS

TYPE FILTER	WEIGHT TEST (Synthetic Dust)	NBS TEST # METHOD (Atmospheric Dust)	DOP TEST (0.3 Micron Smoke)
Cambridge ABSOLUTE®	*	*	**99.97 Min.
Cambridge MICRETAIN	*	99	95
Cambridge AEROSOLVE® 95	*	90-95	80-85
Cambridge AEROSOLVE 85	99	80-85	50-60
Cambridge AEROSOLVE 35	96	30-35	20-30
Electronic Precipitator	99	85-90	60-70
Pleated Paper	94	25-30	15-20
2" Cleanable	76	8-12	2-5
2" Throwaway	76	8-12	2-5

*Practically 100%. Test not practical for more accurate reading.
#National Bureau of Standards Discoloration Test.
**Maximum Allowable Penetration of Dioctyl Phthalate Smoke 0.03%. Every filter individually tested.

Cambridge AEROSOLVE cartridges of 95%, 85% and 35% efficiency are all interchangeable for easy adjustment to future efficiency requirements.

Write for Bulletin 132

Cambridge® Filter Corporation
734 E. Erie Blvd., Syracuse 1, N. Y.

Pioneers in High Efficiency Air Cleaning

REPRESENTATIVES IN PRINCIPAL CITIES

Briefly Stated

training and experience in pump engineering. A member of the Hydraulic Institute (the trade association of the pump manufacturers) Mr. Annis has taken an energetic part in its activities. . .

Alden T. Bloxham was appointed manager of fan sales, Industrial Division, JOY MANUFACTURING CO., with headquarters in Pittsburgh.

To this post, Mr. Bloxham brings from the San Francisco field office ten years of experience in axial and centrifugal fans. . .

A series of promotions and new assignments have been announced by YORK DIV., BORG-WARNER CORP., York, Pa.

R. F. Kelly has been named manager of distribution, succeeding W. E. Landmesser. Replacing him as Northeast Region sales manager is P. F. Whittemore, formerly of the Southeast District office. In connection with this shift of personnel, the Northeast Region offices are being moved from Philadelphia to New York City.

Replacing Mr. Whittemore as district sales manager for residential and commercial products in the Atlanta office is John C. Rose, formerly a merchandise manager at the York headquarters.

After seven years as district sales manager in the Southeast Region, J. R. Pollock has been appointed regional sales manager for the Central Region. He is being replaced by Paul W. Brown, who recently joined the company. . .

John W. Hall has been appointed sales engineer of the Solenoid Section of MARSH INSTRUMENT COMPANY division of Colorado Oil and Gas Corporation, Skokie, Ill. His experience includes important posts with Mills Industries, Inc., Admiral Corporation, and AP Controls Division of Controls Company of America. . .

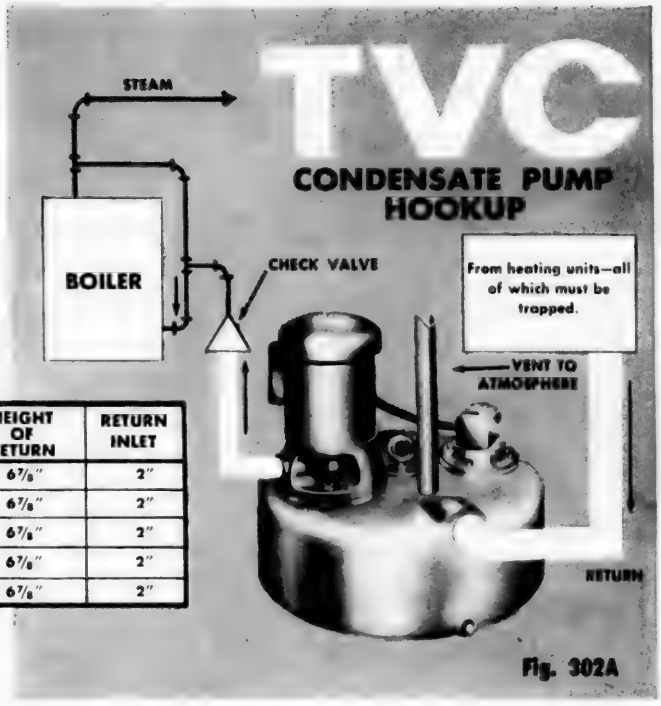
James F. Garland has been appointed a corrosion engineer for A. M. BYERS COMPANY, wrought iron producer of Pittsburgh, Pa. He was previously associated with

(Continued on page 144)

the weil LOW RETURN CONDENSATE PUMP

with

- LOW RETURN CONNECTION
- CAST IRON RECEIVER
- 1750 RPM MOTORS



UNIT NO.	SQ. FT. E.D.R.	CAP. G.P.M.	H. P.	PUMP DISCH.	HEIGHT OF RETURN	RETURN INLET
TVC 19	750	1.5	¼	1"	6⅞"	2"
TVC 23	1000	1.5	¼	1"	6⅞"	2"
TVC 29	2000	3.0	¼	1"	6⅞"	2"
TVC 35	4000	6.0	¼	1"	6⅞"	2"
TVC 41	6000	9.0	½	1"	6⅞"	2"

Discharge pressure: 20 lbs. P.S.I.

Low speed (1750 RPM) assures long life and the float switch control built into this unit means trouble-free service. See Sweet's Catalog or send for Bulletin TVC-300 for full specifications and pumps with capacities to 15,000 sq. ft. EDR.

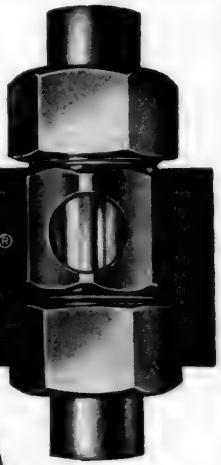
weil PUMP CO.

STOCKED BY THE BETTER JOBBERS

SEND FOR BULLETIN TVC-300.

1516 N. Fremont Street • Chicago 22, Illinois

PROVED ON THOUSANDS OF PRODUCTION LINE INSTALLATIONS!



"250" SERIES
LIQUID EYE®
POSITIVE SEALING INDICATORS
designed to save you even more time and money

DESIGN FEATURE

extension-gasket . . . ALL ONE-PIECE!
A built-in gasket that's always in place for positive sealing and foolproof assembly.

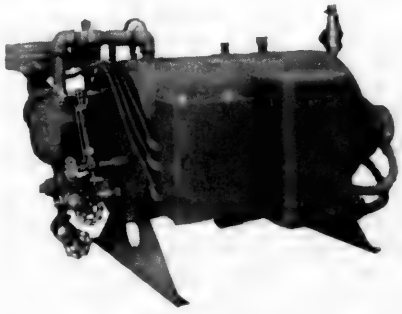
6 sizes now available: ⅜", ½", ⅝", ⅞", 1⅛" and 1⅜" O.D.S.

The "250" has all the proved Liquid Eye advantages *plus* these newly engineered features:

- **smaller—more compact, simplified design.**
- **preformed copper extension eliminates need for separate gaskets—*foolproof* installation.**
- **complete, self-contained, economy unit.**

Write today for catalog E-57 covering the complete Allin line.

Allin
ALLIN MANUFACTURING CO.
410 N. Hermitage Ave. - Chicago 22, Illinois
Over 1,000,000 Liquid Eyes Sold to Date!



NEW—ELECTRIC STEAM BOILERS

10 sizes — .6 H.P. to 6 H.P.
6 KW to 60 KW.
240 or 480 volts normal
208 " available
Highly sensitive adjusting controls.

ALL SIZES ASME construction,
National Board inspected,
Underwriters listed.
100 lbs. max. operating pressure.

Perfect for department store alteration rooms, plastic laboratories, hospitals, etc. Also full line of small gas fired and oil fired boilers, 100 to 125 lbs.

P. M. LATTNER MFG. COMPANY
Cedar Rapids, Iowa

WIREMOLD®
AIR DUCT

SAVES TIME AND MONEY

ON EVERY CONNECTION

No sleeves, no clamps—join two lengths simply by screwing them together.

No cuffed ends, either, so making connections to end fittings is extra fast.

No other duct has these advantages, made possible by Wiremold's unique mechanical construction: **flat metal locked to fabric.** Write for folder.

FOR AIR CONDITIONING / EXHAUSTING
MATERIALS HANDLING / MANY OTHER USES

WIREMOLD®
AIR DUCT

THE WIREMOLD COMPANY • HARTFORD 10, CONN.

THE WIREMOLD CO., HARTFORD 10, CONN. 6-OA
Please send NEW folder.

name

company

address

city state

Briefly Stated

(Continued from page 142)

Rockwell-Standard Corporation as head of its Analytical Chemistry R&D Laboratory. . .

Appointment of Dr. Carl S. Oldach as assistant general manager of Organic Chemicals Dept., E. I. DU PONT DE NEMOURS AND CO., Wilmington, Del., was announced. Dr. Oldach, director of sales of the "Freon" Products Division, succeeds William C. Kay, recently named general manager of the Elastomer Chemicals Department. Dr. Phillip J. Wingate, director of manufacture of the Organic Chemicals Department, succeeds Dr. Oldach. . .

Newell W. Mitchell, veteran metallurgist and specialist in corrosion problems, has joined BRIDGEPORT BRASS CO., Bridgeport, Conn., as a consultant on corrosion problems in the heat exchanger field. He will work in conjunction with the Technical Services department of the Sales division which provides technical assistance on customers' metallurgical problems. Mr. Mitchell is known in the metals industry and is the author of numerous technical publications dealing with the uses of copper alloys, specifically their importance as a corrosion resistant metal. . .

The appointment of John J. Cullinane as sales representative for YOUNG RADIATOR CO., Racine, Wis., has been announced by the company's Heating, Cooling and Air Conditioning Division. Mr. Cullinane's address is 4702 North 58th Avenue, Glendale, Ariz. His fourteen years of sales engineering experience include eleven years with Westinghouse and two with a Phoenix manufacturers representative. In his new position he will promote Young heating, cooling and air conditioning in the Phoenix area. . .

Appointment of Robert L. Halstead as manager of the Milwaukee district has been announced by ALLIS-CHALMERS INDUSTRIES GROUP, Milwaukee, Wis. He succeeds A. P. Bowman, who has been transferred to North Central regional headquarters in Chicago as

FILTER EFFICIENCY at a glance... ANYTIME!

Dwyer

AIR FILTER GAGE

With the Dwyer Air Filter Gage you can be sure of maximum filter efficiency because you know the *exact* time to replace filters, *every time*. Gives a continuous, accurate check that spots inefficient filters, yet prevents waste through premature replacement.

The Dwyer measures filter efficiency the only practical and economical way—via pressure drop. Quickly pays for itself through savings in replacement and service time and greater operating efficiency.

Break-proof plastic construction, lifelong accuracy, simple installation, no moving parts to ever wear out or get out of adjustment. Ranges 0-½", 0-1", 0-2" and 0-3" water. A complete unit with all necessary tubing, fittings, etc.

Write for Bulletin C10

F. W. DWYER MFG. CO.
P. O. Box 373-N • MICHIGAN CITY, IND.

manager of Industrial Equipment Division sales. . .

Carl E. Widell has been elected vice-president in charge of marketing by WAGNER ELECTRIC CORP., St. Louis, Mo., succeeding Harold N. Felton who will remain with the company as a vice-president in an advisory and consulting capacity. Mr. Widell will be responsible for the overall marketing activities of both the electrical apparatus and the automotive braking equipment divisions.

OBITUARIES

R. E. Brooks, 77, a pioneer in the packaged boiler industry, has passed away in Milwaukee. With J. C. Cleaver he founded CLEAVER-BROOKS COMPANY in 1931 and served as president of the company until 1943, when J. C. Cleaver became president. At that time, Mr. Brooks was named chairman of the board and served in that capacity until his death.

The first packaged boiler installation was made in 1932 when the company was manufacturing mobile boilers to heat asphalt and road oils for highway construction. A built-up boiler failed at a small dairy in Kenosha, Wis. In response to an emergency call for help, a portable boiler was wheeled in and hooked up, pulling off steam with no loss of production. Dairy management was so pleased with the efficiency that it made it a permanent installation by removing the wheels. Messrs. Brooks and Cleaver took the cue and set out to design special units to serve as packaged boiler installations, and so began a new industry.

Ralph Penn, vice-chairman of the board of directors of PENN CONTROLS, INC., Goshen, Ind., automatic controls manufacturer, died April 4th in Los Angeles. Mr. Penn had been associated with the controls company since 1919 when he joined his brother Albert in the "switch" business. For over forty years Ralph Penn helped guide the company from a very humble beginning to that of its present position of an international organization. He was treasurer of the company for many years before serving as vice chairman of the board of directors.

Engineered Features of Super-Silvertop Steam Traps Assure Trouble-Free Operation

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BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

THE NEW PRODUCT

Detailed information on how to find ideas for, and how to price, develop, sell, and advertise new products, is presented in The New Product, by Delmar W. Karger. It provides useful checklists that aid in avoiding common pitfalls and at the same time insures the step-by-step success of the new product project.

The entire subject is approached from the viewpoint of general management. Basic concepts of top management planning and organizing for new product development are covered, as well as each major functional area of the business enterprise pertaining to the successful development and marketing of new products. Those who have had little or no experience in product development will find it particularly useful as a guide.

Topics covered, by chapters, are: Basic concepts, organizing for product development, finding new product ideas, costing and pricing the new product, patents, research and engineering, market research, sales, advertising, and management considerations of new product development.

Included in the book is an extensive alphabetically-arranged bibliography which should prove valuable to those desirous of obtaining additional information.

The author is a registered professional engineer, an industrial engineer and is now professor and head of the Department of Management Engineering at Rensselaer Polytechnic Institute. He was formerly manager of new product development, The Magnavox Company.

The New Product, by D. W. Karger. Cloth bound, 6 x 9 inches, 234 pages. Published by The Industrial Press, 93 Worth St., New York 13, N.Y. Price, $5.

AIR SAMPLING INSTRUMENTS

Air Sampling Instruments for Evaluation of Atmospheric Contaminants has been published by the American Conference of Governmental Industrial Hygienists. This manual consists of a section of seven papers which outline the techniques of air sampling and a catalog section which illustrates more than 100 instruments specifically designed for air contaminant sampling.

Each of these instruments is described in terms of its uses, operating principles, performance and operation, calibration and maintenance instructions. Each of the instruments described is illustrated.

It is the intention of the Committee on Air Sampling Instruments to revise the information contained in the manual, every two years, and to add new air sampling instruments that were developed during the intervening years. The loose-leaf format of the book was selected so that revision might be facilitated.

(Continued on page 148)

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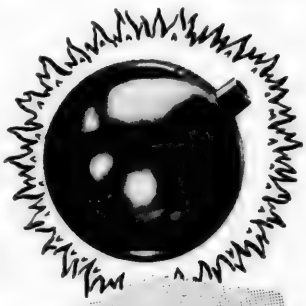

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(Continued from page 146)

The following papers appear in the book:

Sampling and Analyzing Air for Contaminants in Work Places, by Leslie Silverman

Home Assembled Instruments, by Alfred N. Setterlind

Instruments for Sampling and Analyzing Organic Vapors in Air, by E. M. Adams

A New Condensation Nuclei Meter, by T. A. Rich

Developments in the Sampling of Air-Borne Dust, by Theodore Hatch

The Calibration of Gas, Vapor and Dust Instruments—Their Accuracy and Sensitivity, by E. W. Gilliland

Filter Media for Air Sampling, by Leslie A. Chambers

Air Sampling Instruments for Evaluation of Atmospheric Contaminants. Spiral bound, paper cover, 8½ x 11 inches. Published by the American Conference of Industrial Hygienists, 1014 Broadway, Cincinnati 2, Ohio. Price, $7.50.

PLUMBING ESTIMATORS GUIDE

Methods for producing accurate estimates for all types of plumbing, heating and piping are covered by Paul G. Davis in his book, Plumbing, Heating and Piping Estimators' Guide. The author is supervisor of construction for Gamble, Pownall and Gilroy, architects, Fort Lauderdale, Fla.

This is a practical book that is intended to guide the estimator so that he can submit profitable bids. Simplified procedures and standards for maintaining full control of the cost factors in a job, are covered.

The book contains 70 labor factor tables that pinpoint the various elements of the work involved in a job. Specific methods of cost analysis are outlined. The reader is shown how to determine the average hourly rate, including methods for computing such cost elements as overtime, travel pay and other factors.

Subject matter covered includes site work, drainage, water and gas piping, equipment and fixtures, boiler plants, outside distribution, mains and branches.

Plumbing, Heating and Piping Estimators' Guide by P. G. Davis. Cloth bound, 5¼ x 8 inches, 208 pages. Published by McGraw-Hill Book Co., Inc., 327 W. 41st St., New York 36, N. Y. Price, $6.50.

BUILDING RESEARCH, INTERNATIONAL

Building Research, International, is the proceedings of a program conducted as part of the 1959 Fall Conferences of Building Research Institute, Washington, D.C.

Included is a report on building research in Japan, by Neil B. Hutcheon of Canada's National Research Council, a report on winter construction methods in Canada, by C. R. Crocker, also of Canada's NRC, and

(Concluded on page 150)

JUST PUBLISHED!

a book that explains and relates all the complex aspects of product development.

by Delmar W. Karger

Professor and Head of Department of Management Engineering
Rensselaer Polytechnic Institute, Troy, N. Y.
National President, MTM Association for Standards and Research
Vice President, American Institute of Industrial Engineers

This is the first book that gives manufacturers a complete picture of successful product development. Intended for management with little or no experience with this subject, THE NEW PRODUCT is a guide they can turn to for help in every area of product development, from where to get ideas to how to advertise. It is basic, yet it coordinates and unifies the many tangibles and intangibles that complicate and mystify even manufacturers experienced in developing new products. In the author's own words, "It is a serious attempt to give practical help to both the old hand at the game and also the neophyte."

It describes in detail how to find ideas, how to test, develop and sell new products. It provides useful checklists that aid a manager in avoiding common pitfalls and at the same time help him secure the step-by-step success of his project.

The entire subject is approached from the viewpoint of general management. Basic concepts of top management planning and organization for new product development are covered, as well as each major functional area of the business enterprise (see contents, left) regarding the successful development and marketing of new products.

This is an important book for today's buyers' market, where success depends on how well a company competes. Today the manufacturer is in the challenging position of having to recognize and utilize his resources to the fullest—to seek new products for new business. Mr. Karger's book provides an answer for the far-sighted manufacturer who wants to know how he too can develop new, successful products; new, profitable markets. Order your copy today! Money refunded if you are not completely satisfied.

CONTENTS

1. Basic Concepts: Product planning, development—Defining the new product—Foundations for product planning and development—Relationships between product newness and increasing market newness (table)—Product planner's specific criteria—Securing product planning help.

2. Organizing for Product Development: Assigning function—Requirements for product developers—Staff function—Organization for new product development in a large company (chart)—Summary sheet for new product (chart) Planning and scheduling.

3. Finding New Product Ideas: Sources of ideas—Synthesizing, catalyzing the idea—Approaching the individual—Extracting ideas from plant personnel—Training others in idea recognization—Printed lists of ideas and/or patents—Licenses available from large industries—Sources for names of manufacturers—Professional marketing firms offering new inventions—Research institutes—Company acquisition.

4. Costing and Pricing the New Product: Cost elements—Cost analysis form for costing new products (chart)—Preproduction engineering—Preproduction engineering estimating form (chart)—Production support engineering—Facility, equipment, purchased material, and direct labor costs—Shrinkage—Scrap—Transportation—Overhead—General Selling and administrative expenses—Skimming and penetration pricing.

5. Patents: Defining invention—What is patentability—How to handle inventions and patents—The patent application—Patent interference—Licenses—File wrapper estoppel—An inventor approaching a manufacturer—Design patents—Copyrights—Trademarks.

6. Research and Engineering: Using the research dollar—Relationship of R & D to engineering—Effective research—Combining knowledge, ability and experience—Barriers to creative thinking—The research function and organization—The engineering function and organization.

7. Market Research: Market factors to be determined—Preliminary market survey—Detailed market survey—Data available from government—Government sources of—Data obtainable from associations, chambers of commerce, universities and trade journals—Survey of prospective customers—Cumulative averages—plotting cumulative averages (chart).

8. Sales: Appraisal of general conditions, goals and the market—Appraisal for helping salesmen—Sales activities associated with a typical channel of distribution (chart)—Motivation and sales seminars—Distribution analysis—Industrial salesmen—Analysis of industrial salesman's activities (chart)—How many accounts per salesmen (chart)—Sales territories—Example of market analysis and improved sales representation—Salesman's compensation—Manufacturer's agents—Data on sales and commissions of manufacturers agents (chart)—Locating prospective agents—Functional feature strategy.

9. Advertising: The value of repetition—Remembering a product of 4-week exposures (chart)—At 1-week exposures (chart)—Law of diminishing returns and examples (chart)—The advertising agency—Agency evaluation—Advertising sales promotion program—Field studies—Free product publicity—A new product news release—A new literature release—Inquiries to advertising—Direct mail—Trade show exhibits—Check list for exhibiting.

10. Management Considerations of New Product Development: Managing projects—priority and schedule—Laboratory to production schedule (chart)—Presenting proposal to management—Know your management—Profit margins—Ease of manufacture—Capital investment—Personal factors—Let the "favorite" make the presentation—Short reports—The picture technique—Group versus individual presentation—Considerations for favorable development of new products—Sources of new product ideas—Selecting new product—Costing check list—Manufacturing the product—Market research and sales check list.

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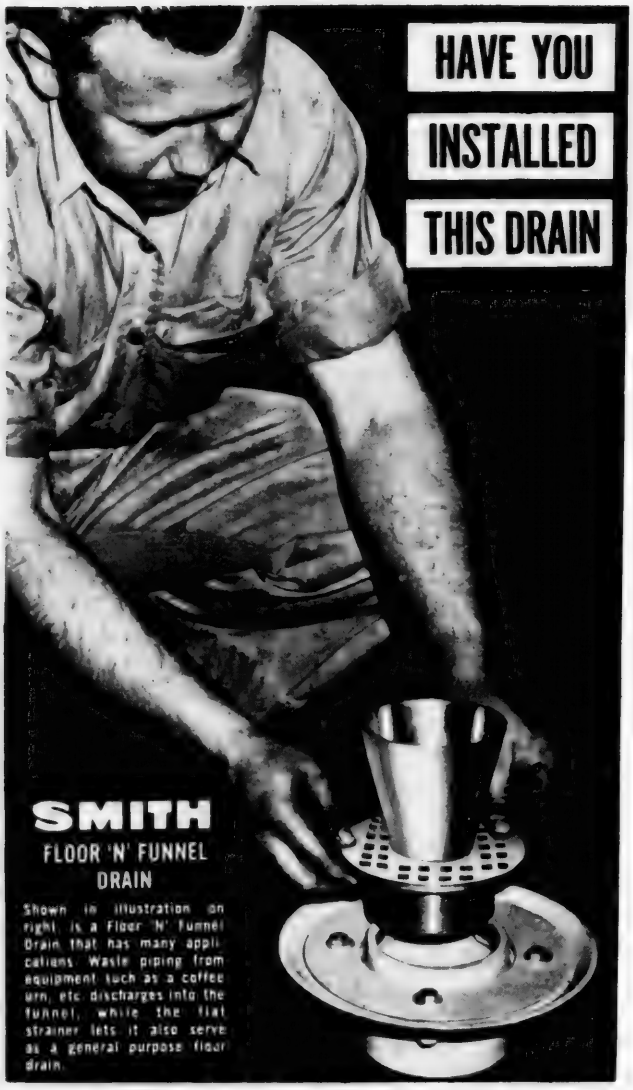
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(Concluded from page 148)

a report on building research in South Africa by M. F. Kaplan of South Africa's National Building Research Institute.

Also included are reports of various sessions of the International Building Congress (CIB) in Rotterdam by Edmund Claxton, vice-president of Armstrong Cork Company, Grayson Gill, of Grayson Gill, Inc., architects and engineers; and H. R. Snoke of the National Bureau of Standards. These reports neatly summarize the progress of the science of building technology in Europe, including European thinking on mass housing in tropical areas, standardization of dimensions on the building site, calculation of construction safety factors, research on large concrete elements, flat roofs, and heat insulation and moisture effects.

Readers of ACH&V will find most interesting the illustrations and text on the use of polyethylene enclosures within which construction of large and small buildings proceed all winter in the colder parts of Canada. Work in South Africa on low-cost housing for the Bantu native, on natural ventilation in schools, on prevention of hailstone damage, and on corrosion resistance of concrete is ably covered by Mr. Kaplan.

While these reports have little to do directly with heating and air conditioning, the mechanical engineer may learn much from these reports about the larger structures of which his practice is a part.

Building Research, International, paper bound, 8½ x 11 inches, 41 pages. Published by Building Research Institute, National Academy of Sciences—National Research Council, Washington 25, D.C. Price, $1.50.

Wrought Steel and Wrought Iron Pipe—American Standard ASA B36.10-1959 on Wrought Steel and Wrought Iron Pipe has been published by the American Society of Mechanical Engineers. Preparation of this standard was sponsored by the ASME and the American Society for Testing Materials. Many ASTM and API specifications related to piping materials were reviewed before these standards were prepared. The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y. Price, $1.50.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available

NDHA MEETING—Annual meeting of the National District Heating Association, at Grove Park Inn, Asheville, N. C. Secretary of the Association, 827 N. Euclid Ave., Pittsburgh 6, Pa. . . . . **JUNE 6-9, 1960.**

ASHRAE MEETING—Annual meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., at Royal York Hotel, Vancouver, B. C., Canada. Secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 13-15, 1960.**

ASTM MEETING—Annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 26-JULY 1, 1960.**

(Concluded on page 152)

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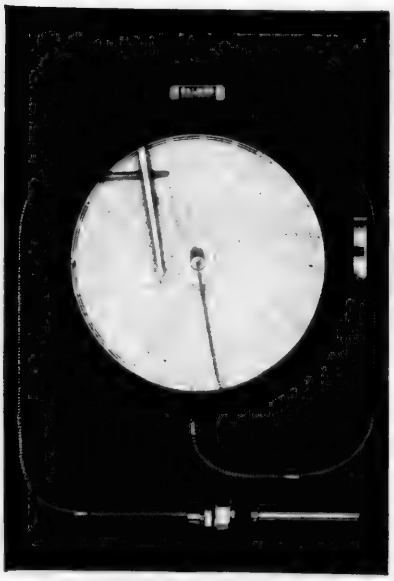

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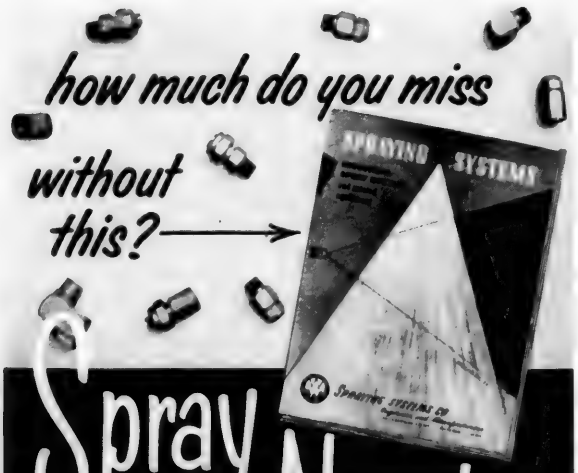

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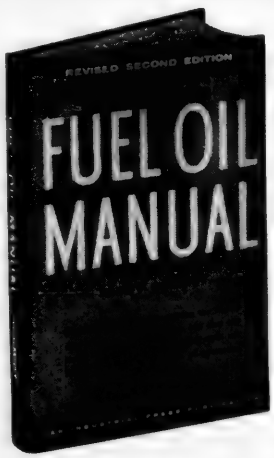

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(Concluded from page 150)

CONGRESS ON OCCUPATIONAL HEALTH—13th International Congress on Occupational Health, at the Waldorf-Astoria Hotel, New York City. James W. Muckell, executive secretary, Room 415, 527 Madison Ave., New York 22, N. Y. ..... **JULY 25-29, 1960.**

CRYOGENIC ENGINEERING CONFERENCE—1960 Cryogenic Engineering Conference sponsored by the University of Colorado and the National Bureau of Standards at the University of Colorado, Boulder, Colo. K. D. Timmerhaus, secretary, Chemical Engineering Department of the University, Boulder, Colo. **AUGUST 23-25, 1960.**

WELDING SOCIETY MEETING—Fall meeting of the American Welding Society, at the Penn-Sheraton Hotel, Pittsburgh, Pa. A. L. Phillips, AWS, 33 W. 39th St., New York 18, N. Y. ..... **SEPTEMBER 26-29, 1960.**

ISA EXHIBIT AND MEETING—ISA Instrument-Automation Conference and Exhibit, in conjunction with the 15th annual meeting, at the Coliseum, New York, N. Y. W. H. Kushnick, executive director, Instrument Society of America, 313 Sixth Ave., Pittsburgh 22, Pa. ..... **SEPTEMBER 26-30, 1960.**

ASSE MEETING—Annual meeting of the American Society of Sanitary Engineering, at the U. S. Grant Hotel, San Diego, Calif. S. Schwartz, secretary of the Society, 228 Standard Building, Cleveland 13, Ohio. ..... **OCTOBER 9-14, 1960.**

BRI FALL CONFERENCES—Fall Conferences of the Building Research Institute, at the Shoreham Hotel, Washington, D. C. Harold Horowitz, Assistant Director for Technical Programs, BRI, 2101 Constitution Ave., Washington 25, D. C. .... **NOVEMBER 14-16, 1960.**

ARI ANNUAL MEETING—First annual meeting of the Air-Conditioning and Refrigeration Institute, at the Hollywood Beach Hotel, Hollywood Beach, Fla. Geo. S. Jones, Jr., manager of ARI, 1346 Connecticut Ave., N.W., Washington 6, D. C. ..... **NOVEMBER 18-22, 1960.**

POWER EXPOSITION—24th National Exposition of Power & Mechanical Engineering, sponsored by the American Society of Mechanical Engineers, in conjunction with its annual meeting, to be held at the New York Coliseum, New York City. E. K. Stevens, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. ..... **NOVEMBER 28-DECEMBER 2, 1960.**

Canadian Degree-Days for April, 1960*

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	1960	Normal	1959-60	Normal
Calgary, Alta.	746	770	8650	8510
Charlottetown, P. E. I.	872	870	2063	7770
Crescent Valley, B. C.	660	610	7629	7210
Edmonton, Alta.	660	760	9133	9420
Fort William, Ont.	852	890	9458	9640
Grande Prairie, Alta.	709	830	8832	9930
Halifax, N. S.	723	765	6244	6762
London, Ont.	587	650	7045	6900
Medicine Hat, Alta.	639	620	8360	8130
Moncton, N. B.	819	830	7449	8020
Montreal, P. Q.	683	730	7714	7970
North Bay, Ont.	818	840	9113	9050
Ottawa, Ont.	670	730	8074	8250
Penticton, B. C.	504	490	6148	6010
Prince George, B. C.	682	740	8328	8500
Quebec City, P. Q.	845	850	8488	8810
Regina, Sask.	800	790	10343	9980
St. John, N. B.	812	830	7335	7870
Saskatoon, Sask.	782	800	3807	10190
Timmins, Ont.	949	1010	10457	10510
Toronto, Ont.	572	646	6565	6582
Vancouver, B. C.	465	480	4948	4910
Victoria, B. C.	491	470	4785	4520
Windsor, Ont.	484	580	6342	6290
Winnipeg, Man.	875	810	10305	9988

* These data are supplied through the courtesy of the Meteorological branch, Air Services, Department of Transport, Canada.

The Department reports a slight revision in the figure for February as published in last month's issue. Corrected figure is Charlottetown, P. E. I., 1191.

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Quickdraft Corp. 146

(Continued on page 154)

316 STAINLESS STEEL

Welded

BOURDON TUBE

Incorporated

In This New Series

of

MERCOID

PRESSURE CONTROLS

SERIES D-41, 243, 541

316 stainless steel Bourdon tube and pressure connection. All parts in contact with pressure media are of 316 stainless steel. Has outside adjustments. Visible calibrated dial, and hermetically sealed mercury contact. Internal mechanism is nickel plated.

Available in operating ranges from 30" vac.-75 psig. up to 100-1000 psig., with varying differentials and electrical capacities to meet your application.

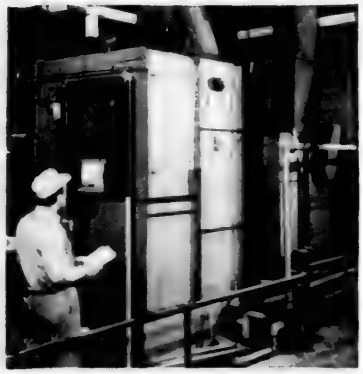
Three case styles: General Purpose NEMA 1; Weather-Proof NEMA 1A, 2, 3, 4; Explosion-Proof Class 1 Group C, & D; Class 2 Group E, F, G, NEMA 7, 9, 9A.

WRITE FOR BULLETIN 019

THE MERCOID CORPORATION
4209 BELMONT AVE.,
CHICAGO 41, ILL.

DRY and CLEAN AIR at the RIGHT TEMPERATURE

- to control your product quality
- to protect a critical operation
- to protect apparatus from moisture damage
- to DRY your material or product
- to control packing or storage conditions
- to assure precision in testing or research
- to increase air conditioning capacity



Air Condition by the NIAGARA Method Using HYGROL Liquid Absorbent

This compact method, giving high capacity in small space, removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the air.

Most effective because... it removes moisture as a separate function from cooling or heating and so gives a precise result, and always. Niagara machines using liquid contact means of drying air have given over 20 years of service. The apparatus is simple, parts are accessible, controls are trustworthy.

Most reliable because... the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions... no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.

Most flexible because... you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Write for Bulletins 112 and 131 and complete information on your air conditioning problem.

NIAGARA BLOWER COMPANY

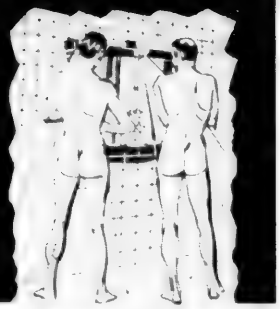
Dept. HV-6, 405 Lexington Ave., New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

NEW ECONOMICAL SHOWERS

BRADLEY

WALL-MOUNTED TYPE THREE- OR TWO-PERSON UNITS



Here's another Bradley Multi-Person Shower—the new Wall-Mounted Type—two or three showers in one self-contained unit.

You can have Showers at low cost because installation on wall at any height requires but *one set of piping connections*—no floor space is needed and each bather has individual control of water volume and temperature.

Made in stainless steel or enameled steel (in white and six decorator colors)—attractive, self-contained and assembled. For dimensions and other data see page 2 of new Shower Bulletin H-1322. Copy mailed on request. BRADLEY WASHFOUNTAIN CO. 2352 West Michigan St., Milwaukee 1, Wis.

Write for Bulletin H-1322

Bradley

BRADLEY multi-person showers

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* Advertiser appeared in preceding issue

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

PACKLESS RADIATOR VALVES ..... are but part of the extensive line of heating specialties offered by Marsh Instrument Co. Other products include traps, gages, and thermometers. Catalog is available.
Inside Front Cover — Item 200

GOOD TRAPPING ..... according to Armstrong Machine Works, prevents corrosion of unit heaters. It is important that these traps be correctly sized. Company offers bulletin which tells how to select and install traps for any type of unit heater.
Page 1 — Item 201

SELF-FLASHING CURB ..... from Penn Ventilator provides three important benefits to the design engineer in roof ventilator installations. Company provides one source for curb, damper and ventilator. Information is offered.
Page 2 — Item 202

NOISE SUPPRESSOR ..... made by Jenn-Air is called the most effective in power exhauster history. It absorbs more than 90% of an exhauster's inlet sound power in less than one foot of space. Bulletin is offered.
Page 5 — Item 203

PNEUMATIC CONTROL SYSTEM ..... from The Powers Regulator Co. satisfied the unusual temperature requirements specified for the new Illinois Psychiatric Institute. A catalog on pneumatic systems for hospitals is available.
Pages 6-7 — Item 204

STEAM TRAPS ..... are available in a complete line from Hoffman Specialty Mfg. Corp. They are designed and constructed to give economical removal of condensate from steam lines, long in-use life, and easy access for servicing. Information is offered.
Page 9 — Item 205

HEATING AND COOLING COILS ..... from Aerofin Corp. were installed in Detroit's new Cobo Hall, described as world's largest convention exhibit building. Information on these coils is available.
Page 11 — Item 206

PACKAGED LIQUID COOLERS ..... are thoroughly checked out at Bell & Gossett Co. so that the units will be shipped with everything mechanically correct and in accordance with the requirements of the order. Information is available.
Page 13 — Item 207

SQUARE PANEL PROPELLER FANS .... manufactured by Ilg Electric Ventilating Co. move up to 37,550 cfm. They are offered in three sizes and a choice of fan wheels. Bulletin is available.
Page 15 — Item 208

DRAFT CONTROL ..... is offered for commercial-industrial gas equipment, and is recommended by leading gas companies. The Field draft control boasts compact size, draft assistance, load flexibility and automatic control. Information is available.
Page 17 — Item 209

NEW ZONE VALVE ..... from Taco Heaters is easy to install, fool proof in operation, and provides the positive, reliable control that today's water heating and cooling systems demand. Information is offered.
Page 18 — Item 210

SUPER-DRY REFRIGERANTS ..... made by Allied Chemical are called Genetron. They are universally accepted for use as original or replacement charges because their tight production standards consistently exceed industry specifications for purity and dryness. Genetron 11, 12, 22, 113, and 114 available. Information offered.
Page 19 — Item 211

STORAGE WATER HEATER ..... for commercial, industrial and institutional use is offered by Patterson-Kelley. Indirect gas-fired unit boasts many advantages. Catalog is available.
Page 20 — Item 212

AIRFOIL BLADED FANS ..... with AMCA-certified ratings are available from American-Standard Industrial Div. Built for both general ventilation and industrial process application, they exceed 90% in mechanical efficiency. Bulletin is offered.
Page 21 — Item 213

FAN-COIL UNITS ..... manufactured by Modine Mfg. Co. permit full-room decorating in buildings with curtain walls or floor-to-ceiling windows. Although midgets in size, these units are giants in performance. Bulletin is offered.
Pages 22-23 — Item 214

INDUSTRIAL AIR FILTER ..... from Research Products Corp. gives you more, costs you less, and provides many features for heating or air conditioning. Information is available.
Page 24 — Item 215

HEATING PUMPS ..... made by Skidmore obviate the need for a custom job. There is a standard pump in this company's line that will meet any one of your exacting requirements: Types VC, in single or duplex; vacuum pump in single or duplex; Type HS; and Type CCVS in three new single units and two duplex units. Four bulletins describe them all.
Page 25 — Item 216

WHEN REGULATORS DEVELOP ..... trouble, engineers want to get them back on the line quickly. That's one reason why more engineers are standardizing on Spence regulating valves with externally mounted pilots. Bulletin is offered.
Page 26 — Item 217

DUAL DUCT SYSTEMS ..... are only part of the family of air conditioning apparatus manufactured by Buensod-Stacey. Other members include dual purpose units, air washers, automatic dampers, humidifiers and dehumidifiers. Information is available.
Page 27 — Item 218

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

A GENERAL PURPOSE PUMP .....
from Taco Heaters, if put into operation today, will not need lubrication until 1970. Compact and light weight, this pump has hundreds of applications, including air conditioning, swimming pools, etc. Information is available.
Page 30 Item 219

A PROTECTIVE HOUSING .....
shields a DeBothezat Bifurcator motor from contact with hot and corrosive fumes. The result: smoother operation and lower motor maintenance cost. Information is offered.
Page 31 Item 220

FLUSH VALVES .....
from Sloan Valve Co. save both water and money when you specify the company's non-hold-open flush valves. Information is offered.
Page 32 Item 221

ALUMINUM FIN STOCK .....
called Truspec is available from Scovill Mfg. Co. It combines superior uniformity in sheet, as well as close tolerance adherence to customers specs. Information is offered.
Insert 33 Item 222

ASBESTOS-CEMENT PIPE BOOKLET ...
offered by Johns-Manville contains 24 pages. Describes the layout and installation economies, wide variety of fittings, diameters, and lengths, its adaptability to venting service. Never needs painting, easily cut, resists most gases, fumes, and dusts.
Page 34 Item 223

HIGH PRESSURE PUMPING .....
without sacrifice in efficiency is yours in two- and four-stage Buffalo pumps for boiler feed and other clear water, high pressure jobs. Information is offered.
Page 35 Item 224

FIVE-WAY HEATERS .....
made by Reznor Mfg. Co. are demanded by tough buyers to project heat where needed on difficult jobs with no waste. Information is available.
Page 36 Item 225

COPPER REFRIGERATION TUBE .....
made by Reading Tube Corp. is called ideal for refrigeration and air conditioning service and for gage lines. It offers uniform softness, long term dependability. Catalog is offered.
Page 37 Item 226

AIR CONDITIONING UNITS .....
from Thermal Engineering Corp. are a comfort aid to education at the Lindsey Hopkins Vocational School in Miami, Fla. Equipment includes horizontal central plant type and multi-zone air conditioning. Catalog is offered.
Page 38 Item 227

TWO BOILER CONTROLS .....
from McDonnell & Miller are called the two best friends any boiler ever had. Devices are pump control and low water cut-off, and make-up water feeder. Information is available.
Page 39 Item 228

STEEL PIPE .....
from USS National, plus the fast, dependable service and technical assistance of a National Tube distributor, speeded an emergency job late at night for one mechanical contractor. This service is available to anyone. Information is offered.
Page 40 Item 229

WATERLESS CONDENSING .....
with McQuay Aircons was selected for a newspaper plant in Lubbock, Texas, where the weather is both hot and dry, and water is a problem. Information on these units is offered.
Page 41 Item 230

CEILING DIFFUSERS .....
called Uni-Flo by Barber-Colman Co. have perforated faceplates which provide a high rate of aspiration and great flexibility to meet the requirements of modular construction for any arrangement of partitions. Catalog is available.
Pages 42-43 Item 231

CAST IRON GAS BOILERS .....
from Weil-McLain Co. save in three important ways: they save a chimney, save space, and save time and labor. Bulletin is offered.
Page 44 Item 232

TUBING PRODUCTS .....
including hard and soft copper water tube, copper air conditioning and refrigeration tube, and heat exchanger tubing, are available from Kensico, a company that is set for the "soaring sixties." Information is available.
Page 45 Item 233

GAS COOLING SYSTEMS .....
are being used by more and more businesses in the Chicago area. 275 gas air conditioning units from Arkla-Servel were installed in a one-year period. Information is available.
Pages 46-47 Item 234

AIR DIFFUSION EQUIPMENT .....
from Waterloo Register Co. is described in a comprehensive catalog which won a Certificate of Merit from The Producers Council of The American Institute of Architects. This catalog is offered by the company.
Page 48 Item 235

WASTES FLOW FREELY .....
in copper drainage systems even after 13 years in service. Save time, effort and money by installing a modern drainage system with Anaconda copper tube and fittings. The American Brass Co. offers information.
Page 49 Item 236

ELECTRONIC AIR CLEANERS .....
outperform conventional filters and make your filtering investment pay off. Westinghouse Precipitron air cleaner can remove up to 95% of atmospheric dirt. Bulletin is available.
Page 50 Item 237

COOLING TOWERS .....
by Halstead & Mitchell cut costs by packaging. These 150-ton packages are used together in any multiple for inexpensive installation and lowered operating costs because of step-control. Like all H&M towers these units carry 20-year guarantee on wetted deck against failure due to fungus attack or rotting. Information available.
Page 51 Item 238

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement. All advertisements are digested here except those that are received too late for inclusion in this listing.

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

FIBER GLASS DUCT LINER ..... from Johns-Manville has "dual density" which is described as an entirely new concept in fire resistant and sound absorbent duct linings. Information is available.
Pages 52-53 Item 239

ELECTRIC MOTORS ..... from Fairbanks-Morse can turn out ½ hp or 10,000 hp, meet every known job demand within this range, or be custom-specified to your blue print projection. Information is available.
Page 108 Item 240

SELF-CONTAINED UNIT ..... offered by Warren Webster provides a complete system for both heating and cooling. Room comfort control is achieved by the turn of a knob, day or night, summer or winter. Information is available.
Page 113 Item 241

FIBER GLASS DUCT LINER ..... from Pittsburgh Plate Glass Co. now bears the label of the Underwriters Laboratories, Inc. It also offers extra advantages such as light weight, easy handling, easy cutting and piecing and fine acoustical qualities. Information is offered.
Page 115 Item 242

HEATING PACKAGE ..... called WhirlPower, manufactured by Iron Fireman, makes a clean flame in a cold firebox because it does not depend for its combustion efficiency on the reflected heat of hot refractory. Information is available.
Page 117 Item 243

TRULY ADJUSTABLE DIFFUSERS ..... from Air Devices, Inc., solve variable air distribution problems. The distinctive Agitair "fingertip control" adjusts air stream toward or away from any occupant to meet any condition. Catalog is offered.
Page 119 Item 244

AIR-OVER MOTOR ..... from Wagner Electric Corp. can save you up to 30% in costs on air moving equipment. These motors can deliver more power than their rated horsepower output. Information is offered.
Page 121 Item 245

VALVES FOR HEATING ..... as well as for the central air conditioning system of The Interchurch Center, New York City, had to be the best, so Jenkins valves were selected. Information is available.
Page 123 Item 246

ASME RELIEF VALVES ..... are offered in a wide range of sizes to permit close matching of relief valve capacity to the boiler load. Bell & Gossett Co. also offers standard relief valves. Bulletin is available.
Page 127 Item 247

CHECK VALVES ..... by Nibco are rated by users as the most dependable. Made for heavy duty, their unique "Y" design provides quick action in opening or closing. Information is available.
Page 129 Item 248

FLAME-RESISTANT TAPE ..... from Arno Adhesive Tapes, Inc., complies with all building codes that require the use of fire resistant duct tape. It sticks instantly and does not dry out. Information and sample are available.
Page 130 Item 249

DRAIN SELECTION ..... is easy when you select from Josam Mfg. Co. You can get the exact drain you need whatever the drainage condition. A descriptive catalog is offered.
Page 131 Item 250

AIR EXHAUSTING DEVICES ..... in 12 different types are illustrated in this month's ad by Western Engineering & Mfg. Co. Information on these ventilators is available.
Page 132 Item 251

AIR FLOW SYSTEM ..... can be balanced once and for all times with the Alnor Velometer. There are no call backs to correct hot or cold spots. Bulletin is offered.
Page 133 Item 252

SOLAR GRILLE ..... offered by Construction Specialties, Inc., affords opportunities for original architectural expression. Infinite variations are possible in pattern, depth, texture, finish and color. Samples and specifications are available.
Page 134 Item 253

BOILER STARTING SERVICE ..... assures lasting satisfaction and is included with the purchase of every Cleaver-Brooks packaged boiler. Boiler operator training is also provided. Information is offered.
Page 135 Item 254

VITAL VENTILATING EQUIPMENT .... is how Burt wall louvers are described. Line is complete from general purpose to industrial types. Data book is offered.
Page 136 Item 255

WATER HEATERS ..... from ADSCO provide continuous flow of hot water for use in washrooms, space heating, or processing. Three bulletins are offered.
Page 137 Item 256

FLEXIBLE HOSE, RETRACTABLE DUCT offered by Flexaust have lowered installation costs in thousands of successful jobs. Other advantages include: exceptional abrasion resistance; corrosion resistance; noise absorption; provision for expansion and contraction. Full details are available.
Page 138 Item 257

BACKWARD CURVE BLOWERS ..... remove flammable and harmful vapors at Gulf Research Center. The manufacturer, Peerless Electric, can engineer a blower for every important air moving job. Information is available.
Page 140 Item 258

Ad-Digest

INQUIRY SERVICE FOR ADVERTISED PRODUCTS

Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail a prepaid multipurpose postcard, either of two that appear on the yellow page following, to request further information from manufacturers.

TURBINE TYPE PUMPS ..... from Aurora Pump offer ruggedness of construction and simplicity of design which combine to provide longer life, high efficiency, and minimize downtime. Bulletin is available.
Page 141 Item 259

THE RELIABLE FILTER ..... manufactured by Cambridge Filter Corp., offers high efficiency positive filtration, low pressure drop, easy installation and maintenance. Company offers expert technical assistance. Bulletin is available.
Page 142 Item 260

ELECTRIC STEAM BOILERS ..... are manufactured by P. M. Lattner Mfg. Co. in ten sizes. Of ASME construction, the units have highly sensitive adjusting controls. Information is available.
Page 143 Item 261

LOW RETURN CONDENSATE PUMP ... from Weil Pump Co. has low return connection, cast iron receiver, and 1750 rpm motors. Low speed assures long life and the float switch control built into this unit means trouble-free service. Bulletin is offered.
Page 143 Item 262

POSITIVE SEALING INDICATORS ..... made by Allin Mfg. Co. proven on thousands of production line installations have one piece extension gasket for positive sealing and fool-proof assembly. Six sizes. Complete line catalog available.
Page 143 Item 263

FLEXIBLE AIR DUCT ..... from The Wiremold Co. saves time and money on every connection since two lengths join simply by screwing them together. Information is available.
Page 144 Item 264

AIR FILTER GAGE ..... from F. W. Dwyer Mfg. Co. tells you exactly when to replace filters, assuring maximum filter efficiency. Gives a continuous, accurate check that spots inefficient filters, yet prevents waste through premature replacement. Bulletin describes the gage.
Page 144 Item 265

STEAM TRAPS ..... from The V. D. Anderson Co. have engineered features which assure trouble free operation. A bulletin giving sizing details for these traps is offered.
Page 145 Item 266

POWER-DRAFT UNITS ..... designed for residential, commercial and industrial applications are offered by Quickdraft Corp. They provide maximum heating or exhausting efficiency at lowest cost. Engineering data bulletin is available.
Page 146 Item 267

PIPE THREAD COMPOUND ..... from Crane Packing Co. won't crack, resists damage, has applicator tip, and is ideal for service kits. Information and sample tube are offered.
Page 147 Item 268

STAINLESS STEEL FLOATS ..... are offered by Arthur Harris & Co. for high pressure, high temperature, and corrosion resistant applications. Catalog is available.
Page 147 Item 269

MORE HOT WATER ..... can be had, and fast, too, with a Ewing automatic heavy-duty vertical hot water heater. And for less cost because it requires no expensive storage boilers, is simple and easy to install and operate, requires no maintenance, and saves valuable floor space. Information available.
Page 147 Item 270

NON-SCALD SHOWER VALVE ..... from Symmons Engineering Co. is called America's favorite. Self-cleaning action prevents clogging and saves water. Literature is available.
Page 148 Item 271

FLOOR AND FUNNEL DRAIN ..... offered by Jay R. Smith is a combination indirect waste receptor and floor drain which has many applications and boasts easy installation. Information is available.
Page 150 Item 272

CENTRIFUGAL ROOF EXHAUSTERS ... of lowest silhouette design by Ammerman enhance the beauty of building skylines. Forward or backward curved wheels within or out of scroll housing. Bulletin is available.
Page 151 Item 273

MERCURY ACTUATED RECORDERS ... from Palmer Thermometers, Inc., provide readings that are clearer, smoother and more precise than ever thought possible. Maintenance is never needed under normal use. Bulletin is offered.
Page 151 Item 274

SPRAY NOZZLE CATALOG ..... offered by Spraying Systems Co. is called the most comprehensive ever printed. It provides unequaled choice of capacities, characteristics and materials.
Page 152 Item 275

DRY AND CLEAN AIR ..... at the right temperature is a product of the Niagara method of air conditioning using Hygrol liquid absorbent. Two bulletins are offered.
Page 154 Item 276

MULTI-PERSON SHOWER ..... is available from Bradley Washfountain Co. in a new wall-mounted type which consists of two or three showers in one self-contained unit, requiring only one set of piping connections. Bulletin is offered.
Page 154 Item 277

FOR MECHANICAL DRAFT SERVICE .. don't choose less than Clarage quality. With anything as vital as uninterrupted operation, it pays big dividends to get the best in equipment. Information is available.
Inside Back Cover Item 278

DUAL ROOM THERMOSTAT ..... is offered by Johnson Service Co. as a two-temperature, proportional action room thermostat designed for flexible day-night control of unit ventilators. Descriptive bulletin is available.
Back Cover Item 279

CIRCLE FOR NEW EQUIPMENT AND LITERATURE INQUIRIES

CIRCLE FOR AD-DIGEST INQUIRIES

PLEASE PRINT CLEARLY

TO ORDER BOOKS DESCRIBED BELOW

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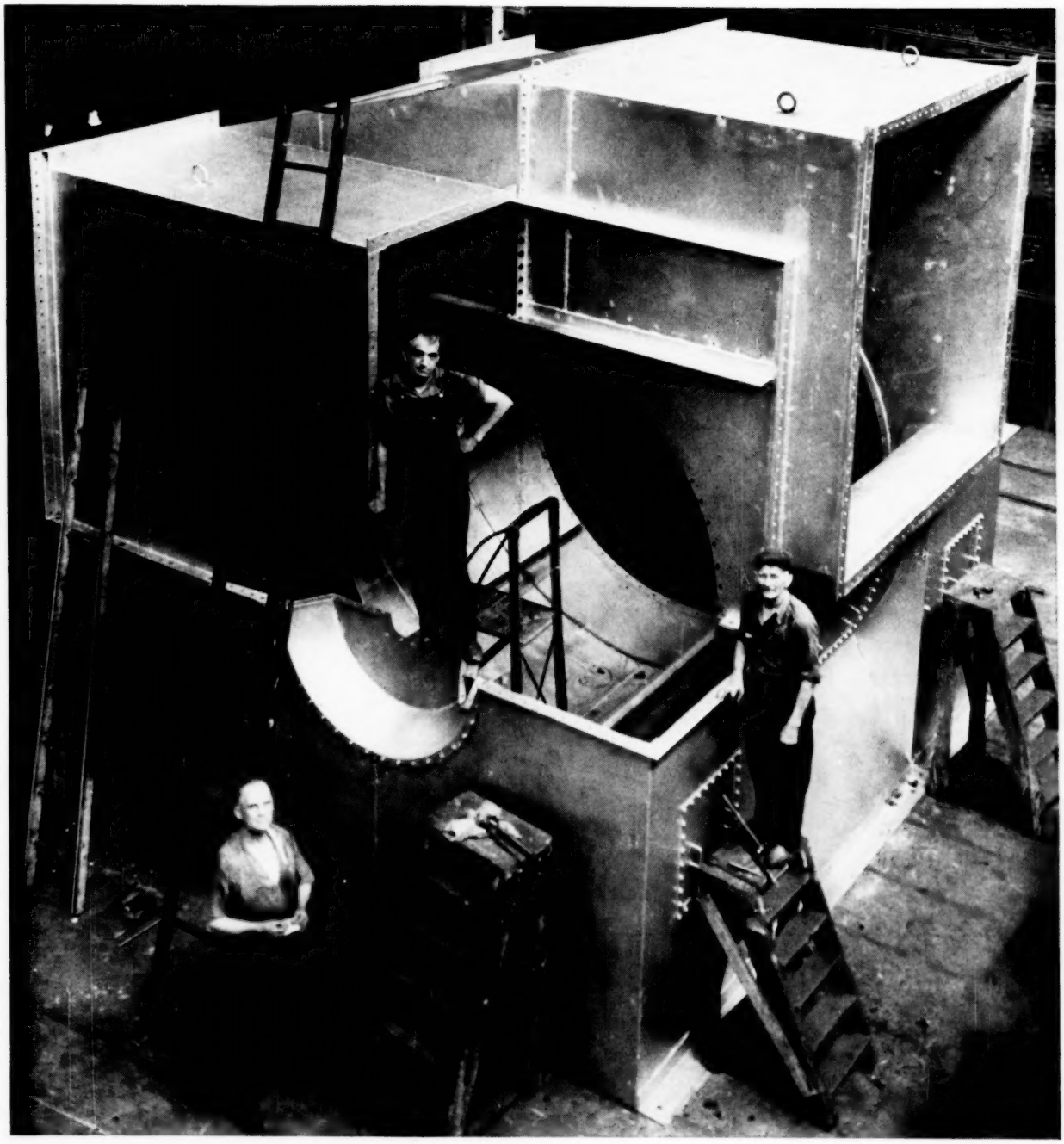

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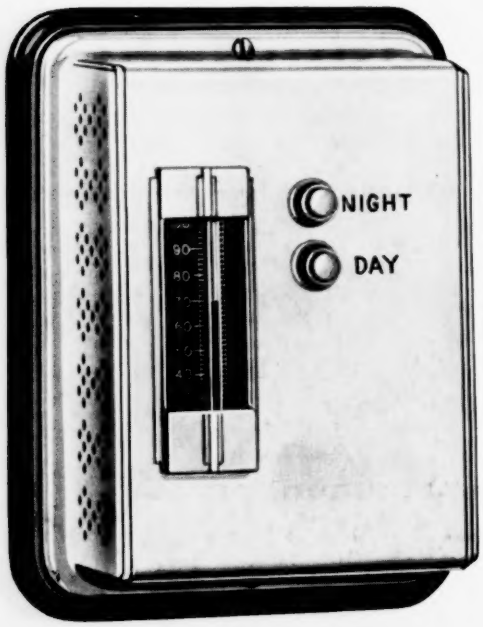

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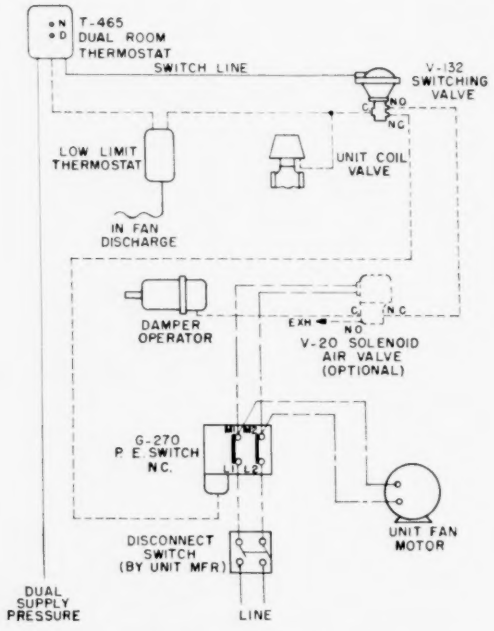

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